THE ELECTRICAL WORLD

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The Law Telegraph Company's Annunciator Switch-board.

This switchboard was on exhibition at the recent telephone convention in Cincinnati, and we referred to it briefly in the account of the exhibits which we published in the issue of Oct. 20, ult. We purposely omitted a more provement," by which we characterized this modification of the Law switch-table in our reference to it in our telephone convention issue. This new form of table is not an improvement intended to take the place of the Law system of exchange connection used in the exchanges operated by the Law Telegraph Company in this city, and which has been introduced with equal success in St. Louis stantly at his post listening to the wants of the subscribers on the same call circuit, in perfect readiness to answer each call, and who has the connections all made in perhaps less time than would be required by the subscriber to drop the annunciator by the ordinary system.

The modified form of the Law switchboard or switch-table, of which we propose to speak, is only an after

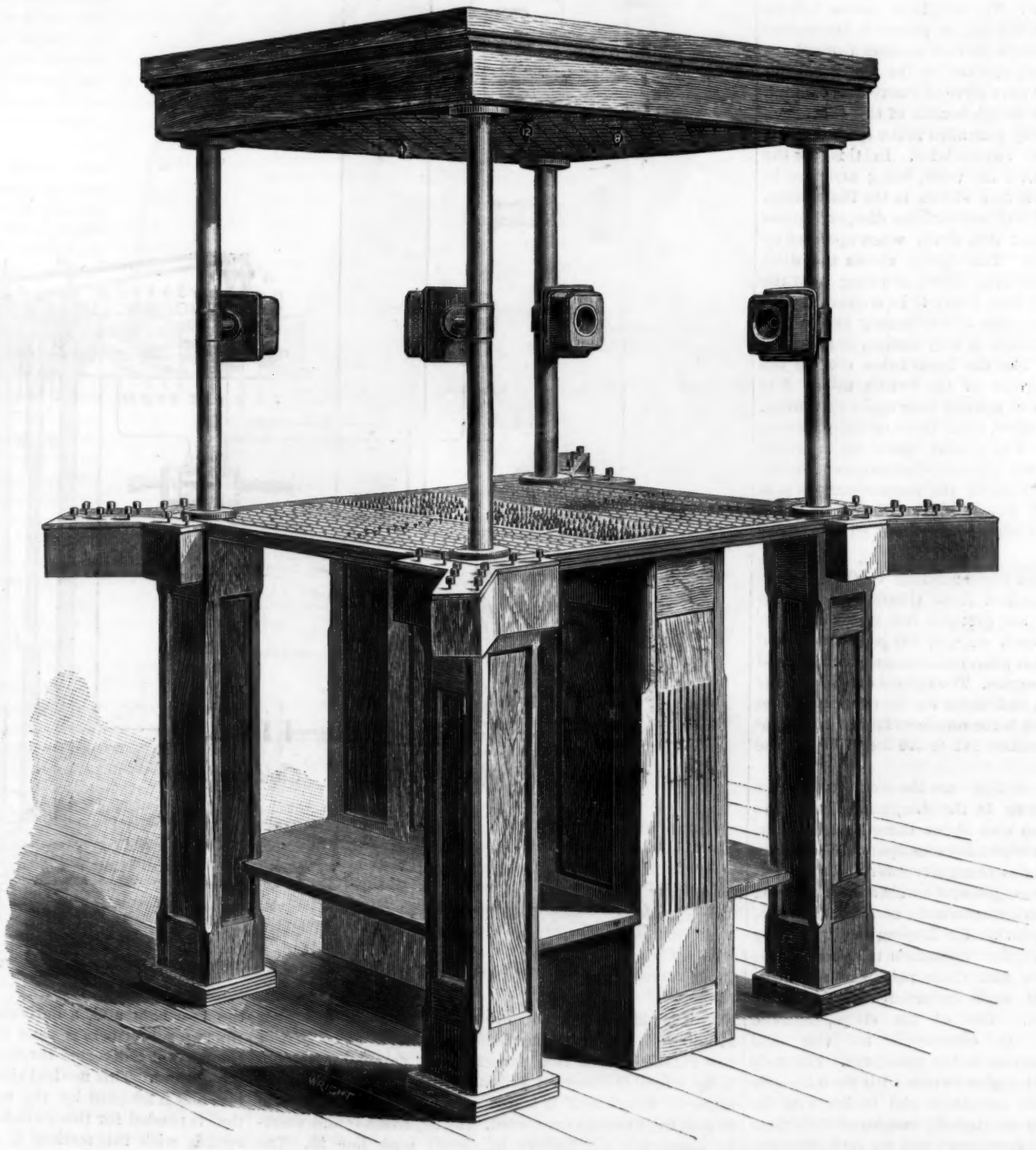

FIG. 1.—THE LAW TELEGRAPH COMPANY'S ANNUNCIATOR SWITCH-BOARD.

detailed description of it at the time, because the necessary illustrations could not be procured in time, and also because the limited space at our command did not allow of as extended a notice as its merits seemed to deserve. We did not intend, however, to let such an interesting and valuable innovation pass by without explaining it fully to our readers, and to this end we present herewith an illustration of the switchboard, with a diagram showing its operation, both of which have been carefully prepared especially for this article.

We say innovation, because Manager Childs, of the Law Telegraph Company, objects strongly to the term "im- and other places. By these the Law system of exchange connection is still preferred and adhered to, because it seems to necessitate less complication both in the apparatus of the subscriber and that of the exchange, and because it affords more prompt and satisfactory service to the patrons of an exchange. The subscriber's apparatus, in this case, it will be remembered, dispenses altogether with the magneto generator, and the annunciators in the central office are also done away with. The subscriber loops his telephone into the "call circuit" by pressing a button that operates a switch, and immediately obtains a "hearing" with an operator at the central office, who is con thought, a side issue, as it were. The extremely compact form, and the great accessibility which are such manifest advantages in the switch-tables of the Law system, suggested the idea that with slight modifications it might prove equally successful as an *annunciator* switchboard, and thus beat the champions of the latter "at their own game," so to speak. In our reference of Oct. 20 we spoke of this modification as being "a return to the conventional switchboard system." This was right, only we should have added that the return of the Law table is not that of a prodigal child to acknowledge the error of its ways, but a return for the purpose of laying claim to a larger share

of appreciation. It is by way of demonstration of these advantages, therefore, that a few specimens of the modified switchboard have been constructed.

Our front page illustration represents this new type of annunciator switch board, and the accompanying diagram serves to explain the construction and operation. The points aimed at in this switch board are to group the ends of the lines so closely and compactly that a large number of them may be accommodated on the same board, and yet be accessible from all sides and to several operators at a time; to make the end of each line movable and to provide it with a plug or peg, so that any two lines may be quickly connected by inserting their plugs into the connecting strips; to place the annunciators out of the way of the operators, and yet to dispose them so that they may be seen readily. The table here shown is only about three feet square, but it is, nevertheless, intended for 500 subscribers' lines. The lines enter through the floor into the boxed space in the centre.

The diagram shows the manner in which the connections are made. Each line is connected at *g* to a brass tube *d*, half an inch in diameter and about two feet long, which is disposed vertically between two horizontal boards studded with holes into which these tubes are driven. A small brass rod *w* slides inside each tube and forms a weight that tightens the flexible connecting cord by which it is suspended. A little flat spring at the upper portion of each rod, as seen in the sectional view of the right-hand tube, serves to insure electrical contact between the tube and the rod. The upper end of the cord is attached to a metallic knob provided with a pin *n* which is to be inserted into the small holes in the connecting bars *a a*, etc., as shown at *n' n'*. The weight of course follows the cord when it is pulled out, as shown in the broken tube *d'*, and is maintaining a perfect contact throughout the motion, while the pull exerted on the pins *n' n'* after they are inserted into the bars serve to insure the contact.

It is well known that in switch-boards of this type, each subscriber's line is normally grounded in the central office, but first passes through an annunciator. In this case the annunciators are placed over the table, being arranged in groups in the roof-like structure shown in the illustration. The number is painted on each annunciator disc, and comes readily into sight as the disc tilts down when operated by the subscriber's magneto. The figure shows the discs marked 4, 8, 12, thus drooping down, showing that the subscribers on these three lines desire to be connected with other subscribers. The manner of connecting the ends of the lines to these annunciators is very simple, as shown in the diagram. It is seen that the brass tubes *d d* do not come quite up to the surface of the switch table. The plugs *n* therefore do not rest against their upper extremity, but they are held against short brass tubes or thimbles *e e e* separated from the tubes *d* by a short space to interrupt electrical connection. Each of these thimbles *e* is connected at *o* to a wire that leads to one of the annunciators *m m m* situated above, as clearly shown in the diagram. After passing through the annunciators the lines all connect to a common ground line.

Normally the 500 plugs corresponding to the 500 subscribers' lines all rest against these thimbles, with pins directed upward. They are grouped into five square sections or "blocks," ten each way, or 100 per section, and instead of numbering each plug, the sections are numbered from 0 to 9 on all four margins. The figures on two parallel sides indicate the tens, and those on the other two sides the units. The first block is for numbers from 1 to 100 inclusive, the next for numbers 101 to 200 inclusive, and so on.

On either side of the sections are the connecting strips *a a a' a'*, *b b b' b'*, as shown in the diagram. These are composed of small brass bars about three-eighths inch, screwed to the table at a slight distance apart. These bars are provided with plug holes at regular intervals. To connect two subscribers' lines together it would suffice to insert their corresponding plugs into two holes on the same strip, but as it is desirable to provide for looping in a "clearing out annunciator," and the operator's telephone, the strips are used in pairs, and these pairs are alternately polished and stained dark in order that they may be easily distinguished. One of the strips, marked *D* in the diagram, is connected to the call battery and pole changer, or to the generator. The strip marked *C* connects through a switch with the telephone apparatus of one of the operators and thence with the ground. Four operators are usually employed with these tables, and consequently four strips, one for each operator, are reserved. The four transmitters used by the operators, are fastened to the corner posts supporting the annunciator case, as the figure plainly shows. The receivers are small disc-shaped, and fastened to the ear of the operator, so that they are always in position and at the same time obviate all the inconveniences to the operator's movements which might result from the adjustable "holder" used in most all exchanges. For an exchange of not over 500 subscribers one of these tables and four operators would suffice. For larger exchanges up to 1,000, more than one table would be necessary. We will first explain the process of making connections between two lines leading to the same table. The apparatus used by the subscriber, it should be noted, is the same as used in connection with all the so-called annunciator systems, and comprises a transmitter telephone bell and magneto generator. Suppose subscriber 25 desires to talk with 27. He calls up the central as usual by turning the magneto-crank by which the annunciator in the central office is made to drop. The operator immediately picks up plug No. 25 and inserts it into the strip *C*, and line 25, instead of being grounded now through its annunciator, is grounded by passing through the operator's telephone to the ground. The operator having ascertained that No. 27 is wanted, can call him in two ways. She can pick up plug No. 27 and touch it to strip *D*, which is connected to the call battery, or she may first make the connections. To do this she inserts plug 25 into one strip and plug 27 into the other of the same pair. In this situation the two lines are connected together through a clearing out annunciator *B*, as will appear on following the connections in the diagram. At *v v'* are shown two small pins normally directed upward by spiral springs so that their lower ends, which are bent, come into contact with pins *x x* connected to the clearing out annunciator *B* corresponding to this pair of connecting strips. Below these ends is a metallic strip *H* connected with the call battery.

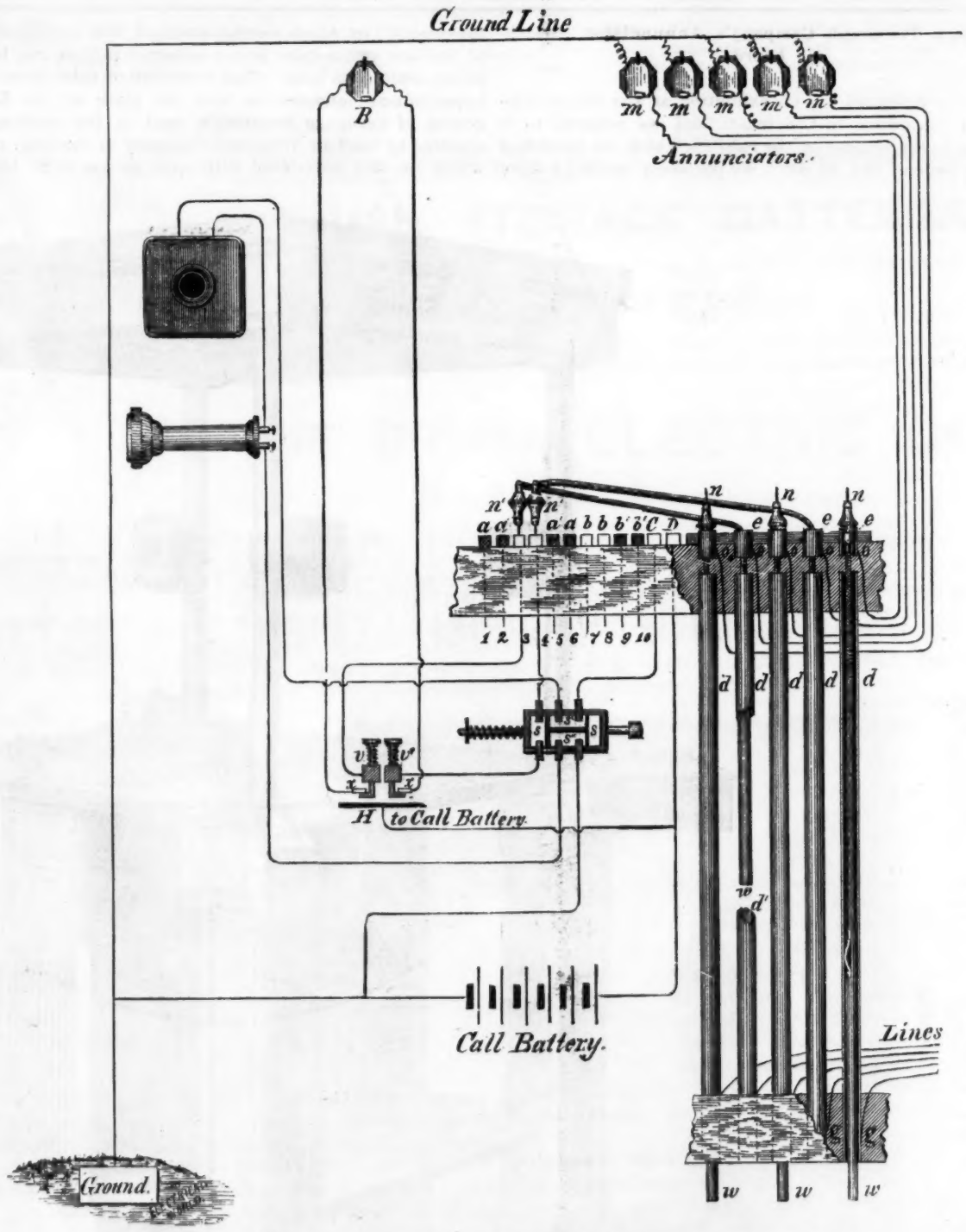

FIG. 2.—DIAGRAM OF LAW TELEGRAPH COMPANY'S ANNUNCIATOR SWITCH-BOARD.

Now it is plain that the operator can call both subscriber 27 and 25. Supposing the left-hand plug *n* to be that of line 27, she can call this subscriber by depressing the pin *v*, by which she literally grounds line 27 through the call battery. Likewise if it is understood that she is to inform 25 that the lines are connected, she depresses *v'* and thereby places the call battery in circuit with line 25. The contact at *x* is opened in both cases, so that the clearing out annunciator is not dropped. Now having completed the connections it is the duty of the operator to ascertain whether the subscribers are in conversation, and in case they forget to drop the clearing out annunciator she must have means of looping in her telephonic apparatus into the connection to determine whether the conversation is ended. To do this she presses the button of the switch shown at the right of *v v'*, by which the four contacts *s s s' s''* are moved to the left until the two left-hand contact strips touch *s'* and *s''* respectively, while the two right-hand strips are short-circuited by the right-hand piece *s*. It will be seen, on following the connections, that the telephone has become looped into the circuit by this procedure. On releasing the switch it is cut out and only the clearing-out annunciator remains between the two lines. To disconnect it is only necessary to pull out the plugs and let them fall back to their places, which they do readily and quickly under the influence of the weights attached to the flexible cords.

In the switch-board itself this telephone switch and the call buttons take a much more simple and practical form. The buttons *v v'* pass through the connecting strips themselves, and constitute a double row arranged transversely across the centre of the strips. When they are depressed they come into contact with a long piece (corresponding to H) that passes under the ends of all these pins, and which is connected to the battery wire. The lines 1, 2, 3, 4, 5, etc., shown in the diagram, go direct to the clearing out annunciators. The telephone switch is also operated by a button passing through one of each pair of strips. These form another transverse row at a slight distance from the double row. The motion of the switch serves to include the telephone into the loop between each pair. In practice, however, it is not found necessary to loop the operator's telephone into the circuit. The operator's telephone wire is just "crossed" with either of the two bars and, a derivation from the circuit between the two subscribers is thus established, by which part of the current is diverted through the operator's telephone to the ground. This method simplifies the switch considerably, and is adopted by the majority of exchanges. All that is needed for this switch-board by way of telephone switch with this method is a simple pin like *v*. When this is depressed it connects the bar through which it passes, and consequently the annunciator loop, with the telephone apparatus, because the contact which it touches is connected with *C*. These contacts are formed by another strip similar to that for the calling battery. As there are four operators and each has a different telephone strip (*C*), it is clear that the same set of switch pins will not answer for all four operators. Consequently four rows have to be provided. This may seem like complication, but in reality it is a simple matter. We must recollect that this telephone switch is the only thing that requires duplicating in the whole switch-board. Otherwise the four operators use the same devices for the whole 500 lines accommodated. If we compare this with the "multiplication"

(*Continued on page* 209.)

The Death of Sir William Siemens.

It is with profound regret that we learn by cable of the death of the eminent scientist, engineer and electrican, Sir Charles William Siemens, D. C. L., L. L. B., F. R. S., from rupture of the heart, at the age of 60 years. About two weeks ago, Doctor, or, as he has lately been known, Sir Charles Siemens, fell in Park Lane, London, and was carried home. He suffered great pain from his injuries and was ordered by his physician to take complete rest. He appeared to recover, but on the 19th became worse, and sank rapidly.

Charles William Siemens, of whom we present a fine portrait on this page, was born at Lenthe, Hanover, on April 4, 1823. He was educated at the Lubeck Gymnasium, the Art school of Magdeburg, and the University of Göttingen; and then, in 1842, entered the engine works of Count Stolberg as a pupil. A year later he went to England to introduce and patent a galvanic gilding and silvering method hit upon by his brother Werner, and made the acquaintance of the great Birmingham firm of Elkingtons, who were then working in the same direction. The Siemens invention succeeded, and is said to have given the poor young scientist his start. In 1844 he again visited England, a country toward which he early displayed strong predilections. The second trip was for the purpose of introducing a differential governor for steam engines. He next brought out in England the process of anastatic printing, which was followed up by the invention of his double air cylinder and chronometric governor. In 1847 he devoted himself to the study of the dynamical theory of heat, and to the use of a regenerator for recovering that portion of the heat which presents itself at the exhaust port of a caloric engine. In 1851 came his water meter, and a few years afterward he and his brother Frederick completed the regenerative gas furnace; and the consequence of the achievement was that he became largely interested in steel works.

That portion of his career which most interests electricians, however, relates to telegraphy and electricity in general. As far back as 1848 he turned his thoughts to telegraphic engineering. In 1858, associated with his brothers Carl and Dr. Werner Siemens, and Mr. Halske, of Berlin, he established the large telegraph works in London bearing the name of the Siemens Brothers. From those works have been turned out the Indo-European, North China, Direct United States, French and Platino-Brazileiro cables, and at the present time the new cables for Messrs. Mackey and Bennett are being made there on improved methods. It was for the Siemens Brothers that the "double-ender" steamship "Faraday" was launched at Newcastle in 1874. Sir William also made a great many original researches on the application of magneto-electric arrangements, by which currents of electricity are increased in strength without the use of several independent batteries. Mr. Wilde having originated the use of electro-magnets for this purpose, Sir William Siemens and Professor Wheatstone invented simultaneously a further use for the idea by using the currents induced by the permanent magnet to convert that magnet into an electro-magnet. In 1854 he introduced his armature. He and his brothers developed the dynamo machine bearing their name, and have taken a leading part in perfecting the electric light. Some of his later experiments related to the production of high temperatures by electricity, and the effect of electricity on plants.

Sir William was prominently connected with several learned and scientific societies. He was the first President of the Society of Telegraph Engineers. In 1862 he was elected a Fellow of the Royal Society; in 1869 the degree of Doctor of Civil Law, *honoris causa*, was conferred upon him by the University of Oxford; in 1874 he received the Royal Albert medal for his researches in heat and his metallurgical processes; in 1875 he was awarded the Bessemer medal of the Iron and Steel Institute. He was, as we understand, knighted recently by Queen Victoria, having become a British subject in 1850, and he was also a Dignitario of the Brazilian Order of the Rose. He served on the Council of the Royal Society in 1867 and 1870. He was at one time President of the British Association. He was also a member of the Council of the Institute of Civil Engineers; a manager and Vice-President of the Royal Institution; President of the Institution of Mechanical Engineers; Chairman of the Council of the Society of Arts. In short, honors of all kinds were showered upon him. It is evident that his powers had not reached their zenith and that his life work was not ended, as only in last May he published his principal literary work, "The Conservation of Solar Energy."

THE LATE SIR WILLIAM SIEMENS.

Growth of the Telephone Service of Maryland.

We have frequently had occasion to refer to the remarkable activity in telephone work in Maryland and the District of Columbia during the present year. The following history of the telephonic operations in that portion of the country, for which we are indebted to the Baltimore *Sun*, is of interest as illustrating what an energetic management may do in the development of a territory:

Although the telephone has been in use in Baltimore for over four years, its extension outside the city is of comparatively recent date. From time to time the Baltimore Telephone Exchange, which began active operations in 1879, established connections with points near the city, such as Towsontown, Pikesville, Catonsville and Ellicott City, and a line was built to the Gunpowder Water-Works for the use of the water department. Local exchanges were also established at Cumberland (which has telephone communication with Frostburg and Lonaconing), Hagerstown and Frederick; but it was not until the beginning of the present year that the development of a system of communication between Baltimore, Washington and various points in Maryland, the district of Columbia and Virginia was undertaken. The franchise of the Bell Telephone Company for Maryland and the District of Columbia is owned by the Chesapeake & Potomac Telephone Company, which in June, 1883, succeeded the old Telephone Exchange Company, itself the successor of the Maryland Telephone Company, organized by Davis & Watts in 1878. The president of the company is Morris F. Tyler, and the general manager is H. B. Lytle. Under Mr. Lytle's direction work is being actively prosecuted in the construction of a system of lines which will connect Baltimore with Hagerstown via Westminster and Frederick. An exchange was established in Hagerstown Feb. 1, 1883, and communication opened with Williamsport, six miles distant. Since then a line has been built to Boonsboro, and additional lines to Waynesboro, Pa., and Sharpsburg are now in course of construction. On Thursday of last week a line from Hagerstown to Frederick was completed. At Frederick centres an important system of local lines. An exchange was established there last June, since when the company has been vigorously pushing the construction of lines in various directions. A line which now connects Frederick with Middletown is to be extended to Ellerton, Myersville and Wolfsville, all in Frederick County. Between Frederick and Westminster a line has been built to Libertytown, a distance of twelve miles, taking in Worman's, Mount Pleasant and Searsville, with a branch from Worman's to Emmittsburg. The rest of the line—from Libertytown to Westminster—will be completed about the first of December. From Libertytown there will be a branch to Unionville. From Westminster the line will be continued to Pikesville, where it will meet the present line, thus establishing communication between Baltimore, Westminster, Frederick and Hagerstown and minor points connected with the same system. The question whether the line will be extended westward to Cumberland has not yet been determined. From Frederick another line is under course of construction to meet the line connecting Baltimore with Elliott City. It has been built as far as Ridgeville, about thirteen miles from Frederick, and will be finished about the first of December. Baltimore will thus have two lines of communication with Frederick, one via Westminster and the other via Ellicott City. The Ellicott City line will take in Newmarket and Ridgeville, in Frederick County, and branches will extend from Newmarket to Kemptown and from Ridgeville to Mount Airy. Another line, from Frederick to Poolesville, a distance of twenty miles, taking in Buckeystown and Greenfield Mills, was completed week before last, and the poles have been set on a branch line to Adamstown. Still another line, connecting Frederick with Washington via Rockville, Montgomery County, has been concluded as far as Rockville.

Baltimore and Washington were first connected by telephone last June by means of a single line of two wires, but since then two more have been added. One of these has been "looped" at Patuxent, a station on the Annapolis & Elkridge Railroad, taking in Annapolis. Communication can also be opened at any time with Patuxent, Odenton, Millersville and Crownsville, on the Annapolis & Elkridge road. Laurel, on the main line, was placed in communication with Baltimore and Washington on Monday. A line has been built from Washington to Hyattsville and Bladensburg, and the main Washington line continues to Georgetown and Alexandria. The Chesapeake & Ohio Canal has a private telephone extending from Georgetown, D. C., to Cumberland.

In the northern and eastern portions of the State but little has been done so far in the way of building telephone lines. The company has under consideration the establishment of exchanges at Elkton, Havre de Grace and Port Deposit, and the construction of a line from Baltimore to Belair, but no definite action has been taken. Local companies or associations have been organized and lines established at Salisbury, Wicomico County (connecting with six local stations); Westover on the Eastern Shore Railroad, connecting with Fairmount in Somerset County; Centreville, connecting with Queenstown and Winchester in Queen Anne's County, and Preston, connecting with Choptank in Caroline County. These lines are not controlled or operated by the Chesapeake & Potomac Company, which merely rents the instruments to the local associations. At no distant day, in all probability, the State will be covered by a network of wires, and it will be possible for a business man in Baltimore to talk with his customers in any one of the leading towns.

Missing a Bonanza.

The fortunes of the telephone have of late years attracted a good deal of attention, and occasionally stories are heard of the manner in which people who might at one time have made large sums of money out of telephone stock neglected to avail themselves of the opportunity. A certain well-known New Bedford capitalist allowed a fortune to slip through his hands by reason of a not surprising lack of appreciation of the value of the patents. He was offered one-quarter of the American patents and one-half of the foreign patents in the early days of the telephone, for about $15,000. After some hesitancy he decided not to take the risk, thinking that the telephone was a pretty toy, but not likely to prove a practical business success.

"Why," said he to a friend at this time, "if I want to communicate with somebody in town or out, on business, I'm not likely to go and shout into that box and trust to it. It would be more natural to telegraph or send a messenger."

So it seemed, and though his judgment was not to be wondered at, at that time, events have proved him sadly mistaken. It would be hard to tell what a quarter of the Bell patents is worth to-day, but it would take several more figures to express its value than those of the original offer. The gentleman in question is said to have bought telephone stock subsequently at about 170.

HE WOULD PRAY BY TELEPHONE.—A few days ago a smallpox patient in St. Louis, who was about to die, requested the presence of a clergyman. None could be found who was willing to enter the room, but one divine offered to kneel down and pray with the unfortunate by telephone. The offer was not accepted, and the patient died without clerical assistance.

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CONTENTS.

ILLUSTRATED ARTICLES: Page.
The Law Telegraph Co.'s Annunciator Switchboard 203
The Death of Sir William Siemens 205
CORRESPONDENCE:
Reis "Parent" of the Telephone 207
Telephone Fire Alarm Priority 208
EDITORIAL:
La Société Internationale Des Electriciens 206
The Telegraph and Telephone Interests 206
The Overland Telephone Co 206
Does the Telephone Injure the Voice? 206
The Electrical Car Propulsion In Belgium 206
Electricity and the Money Market 206
The Conductivity of a Vacuum 207
Telephone Fire Alarms 207
Editorial Notes 207
MISCELLANEOUS:
Growth of the Telephone Service in Maryland 205
Missing a Bonanza 205
The New England Weston and the Edison 208
The Electric Light 208
The Wheatstone System 209
Mr. Edison and Storage Batteries 209
The Armington & Sims Engine 209
DEPARTMENTS:
The Telegraph 209
The Telephone 210
The Electric Light 210
Miscellaneous Notes 211
Business Notices 212
THE ELECTRICAL WORLD'S Illustrated Record of Electrical Patents 212

NEW ADVERTISEMENTS.

A. B. C.—Position Wanted 213
F. W. Wagner.—Electro-Medical Apparatus 213
L. G. Tillotson & Co.—Electrical Supplies of all Kinds 213
The Westinghouse Machine Co.—List of Sales for October 213
Mitchell, Vance & Co.—Combination Fixtures for Gas and Electric Light 216
The Household Magazine Co.—Presents to Subscribers 216
W. J. Johnston.—Books for Holiday Presents 218
W. J. Johnston.—Christmas Announcements ..... 219 to 222
E. P. Tiffany & Co.—Grand Holiday Offer 223
W. J. Johnston,—Calling Cards for 1884 224

La Societe Internationale des Electriciens.

We have received from Paris a circular calling our attention to the above society, a notice of which has already appeared in THE ELECTRICAL WORLD. It has been held advisable, says the circular, to delay until the 15th inst. the admission of members on the foundation, and Jan. 15 for members in the United States. Upon the day first named, a meeting was to take place in the hall of the Société d'Encouragement of the general body of the society, which numbers already nearly 900 enrolled members, belonging to more than twenty nationalities. Among those who, outside the Organizing Committee, have responded to the appeal of the society, issued by M. Georges Berger, the president, are Messrs. Digney, L. d'Arlincourt, Hughes, H. Pellat, Sir Ch. Bright, A. L. Ternant, Sir W. Siemens, W. H. Preece, J. M. Colette, Dr. O. Frolich, Raffard, R. Sabine, Shelford Bidwell, Ceuchod, De Mersanne, A. de Paivà, Ch. de Comberousse, Latimer Clark, Lorenzetti, Ch. Porges, Coumbary, Bourdelles, F. Bolton, Ch. Gornier, W. Thomson, De la Taille, C. and E. de Ordunia, A. de Bejar, C. H. Gray and P. Williere. This brilliant support gives high promise for the success of the society, in the carrying out of an important programme of work.

We learn from the rules and regulations of the society that the president is elected for one year, and that the organization will be composed of three classes of members—honorary, titular, and foundation. It is proposed that the meetings shall be held monthly from October to July, independent of the general annual meeting and special gatherings. The Bulletin of the society will report the proceedings and and will be sent to each member. It is proposed to administer the affairs of the society by a committee of 24 members elected at the general meeting, and eligible for re-election. The officers will be a president, two vice-presidents, two secretaries, and two "tresoriers-archivistes." The annual fee is fixed at twenty francs, which can be compounded by a life payment of 250 francs. The office is at 99 Rue de Grenelle, Paris.

The Telegraph and Telephone Interests.

We learn that a bill in equity has been brought at Boston in the U. S. Circuit Court, by the Western Union Telegraph Co., the American Speaking Telephone Co., and the Gold and Stock and Harmonic telegraph companies against the American Bell Telephone Co., the plaintiffs seeking for an account under the agreement made by them with the defendants. To state the matter briefly, the Western Union seek for a more liberal interpretation of the term "rental" than they enjoy at present. The former controversy between the parties was settled on November 10, 1879, when it was provided that the Bell Company should pay 20 per cent. of its telephone rentals to the Western Union Company. Of late, however, the Bell Company's receipts have increased more largely, it is said, from its interest in telephone exchanges than from the telephone rentals. It is now alleged that the company have not met their obligations under the old November contract, but have sought to avoid them, failing to pay over the royalties and rentals specified in the agreement, and also the increased royalties and rentals as stipulated. The plaintiffs thus claim that the receipts of the Bell Company from the use of their instruments and system, whether in the shape of telephone rentals or in the form of interest in exchanges, are all of the nature of rentals, as specified, in such a way as to give a larger return to the Western Union and its associate companies.

What is now asked for is an accounting and an injunction against entering into further contracts without the consent of the plaintiff, under which contracts property is accepted by the Bell Company as royalty or rentals for the granting of licenses for the right to use their telephones in this country, so long as the agreement of 1879 remains in force.

We are informed by the best authority that this action is not taken with any view to a cessation of the present close relations of the two important interests; that the contract will be maintained; and that the Western Union merely seeks to obtain, if possible, a judicial decision giving it a larger share of the magnificent income now derived from the telephone. The bill was filed last week, and the usual suphœna was issued, returnable in January, 1884.

The Overland Telephone Company.

A correspondent in the far West having written to us for information with regard to the Baxter telephone and its progress, a representative of THE ELECTRICAL WORLD called at the office of the Overland Telephone Company for particulars other than have already appeared in these columns. The original company, of which Mr. R. G. Dun, of the Mercantile Agency, is president, started with a capital stock of $1,000,000, with permission to increase to $10,000,000. Its home office is now 158 Broadway. Mr. R. D. Buchanan, the secretary, states that the company is already in active work, and is in receipt of many proposals for the use of the Baxter telephone by local companies in all parts of the country. The claim put in for the instrument is that it is not an infringement of the Bell patents; that successful experiments have been made over a distance of nearly 800 miles, that it can be admirably used on underground lines, and that it is cheap, the parent company charging no royalty on its patents, and allowing each sub-company to establish exchanges on a liberal basis. So far, the capital of the companies formed or in process of formation reaches more than $12,000,000. The company in this State, with home offices at Syracuse, has a capital of $2,500,000 in 25,000 shares of $100. The president of this company is Mr. J. Forman Wilkinson. Mr. Buchanan says that this New York company is receiving applications from all parts of the State, and is prepared to go ahead. Dr. Beckwith, the general manager of the parent company, has been and is now in Cincinnati engaged in furthering its interests in connection with the Ohio company and other Western developments of the enterprise. Another company has been organized in Philadelphia, and a New Jersey company is in process of organizing a number of sub-companies within its territory.

However, the success of the company, depends of course, upon the outcome of the proceedings now pending in the suit for infringement brought by the American Bell Telephone Company. The Overland people profess to have the utmost confidence touching its result. The Bell Company have applied for an injunction against the Overland Company in Pennsylvania and New Jersey, and, by agreement, Mr. Buchanan says, the argument in both cases will be heard in the U. S. Circuit Court in New Jersey next week.

Does the Telephone Injure the Voice?

This is a question that has been much discussed of late. The result of recent inquiry has been, as shown by us heretofore, that it is extremely doubtful if any injurious effects have arisen from the use of the instrument. In one case in New York where 100 girls are employed by the company, there has never been one complaint; the voices are all as fresh and vigorous as ever, and when the girls are not "talking telephone" they are talking to each other. In another office, that of Pittsburgh, Pa., where some of the girls had been at work over three years, no case of injury to the voice had ever been heard of, although, said the investigator, "among so many it would scarcely have been strange had such an instance occurred from other causes incidental to the influence of climate." In yet another large city, Chicago, the superintendent of the telephone exchange informed an inquirer that during four years he had only known one case where the voice had become seriously impaired, and that was the result of the refusal of the operator to abstain from work when she was suffering from a badly ulcerated throat. This last company has provided for the convenience of its operatives an ear-piece which is strapped to the head, thus rendering unnecessary the constant raising of the arm.

In short, all evidence goes to prove that the telephone is not hurtful to the voice, and we shrewdly suspect that some sour old bachelor first spread the report, then followed it up with the malicious fiction mentioned in a contemporary, the Pittsburgh *Telegraph*, which thinks that the story of the young lady who lost her voice through using the telephone is nothing but a good advertisement, for every married man will now want one for his wife.

Electrical Car Propulsion in Belgium.

The sensation resulting from the experiments made with accumulators for propelling street cars by electricity in Paris a few weeks ago has led to an experiment of like nature in Brussels recently.

The car was of the large size usually drawn by two horses. This car could hold sixteen persons inside and the end platforms afforded standing-room for twelve persons each, or the total carrying capacity was forty persons.

The following data will be of interest to electricians:

Weight of car, empty and without apparatus	2,700 kilog.
" " machinery (dynamo, shafting, etc.)	850 "
" " accumulators—60 cells, 15 kilog. each, with box and liquid	1,500 "
" " passengers	2,500 "
Total	7,550 "

or nearly eight tons.

The 60 accumulated cells are connected in series, and they serve to feed a Siemens dynamo placed under one of the platforms of the car. A suitable switch is provided by means of which either 30, 40, 50, or the whole number of the accumulators may be included, and the speed attained varies from ten to fourteen kilometres per hour according to the number of cells used. The current maintained in circuit is of about 30 ampères, though on curves and grades it may rise to from 50 to 80 ampères. The supply of electrical energy is sufficient to propel the car for four hours. The electromotive force of the cells after that time has lowered to 1.9 and 1.8 volt. The usual daily run is from Antwerp street to Liedts square, via Lacken and the Southern Railway station, a distance of about 20 kilometres.

Electricity and the Money Market.

Recently we spoke of the influence of the telegraph and telephone upon the money market and the rate of interest. Confirmation of our remarks and opinions will be found in the subjoined passage taken from a paper on the same subject by the eminent Oxford economist, Prof. Thorold Rogers, in a subsequent number of *Bradstreet's*: "Furthermore, the shortening of credits by means of instantaneous transfers through the telegraph has had a prodigious effect on trade and prices. As it materially economizes the currency by making it more efficient, it should cheapen the use of gold and so tend to raise prices But it operates more powerfully in the opposite direction by lessening cost, and so it tends to lower prices. I have little doubt that the rapidity with which mercantile intelligence communicated and acted on has materially assisted in making the stock of the precious metals an international factor in currency and exchange, and to make what Adam Smith calls the money of the great mercantile republic more mobile and more manageable. They who have followed the facts see that much of that which a few years ago was characteristic of the foreign exchanges has now become so modified that it has ceased to be accurate, and no one, as I am aware, recognizes this so clearly as Mr. Goschen does whose work on this subject, published some twenty years ago, was once classical." Here the conflicting tendencies are clearly shown. In a short time, political economists in

treating upon money and allied themes will have to devote much of their space to the influence of electrical applications.

The Conductivity of a Vacuum.

The long-existing controversy as to whether a perfect vacuum is a conductor of electricity or not was supposed to have been decided in favor of the negative by the researches of Messrs. Muller, de la Rue and others, but in a communication recently made to the Swedish Academy of Sciences, M. Edland questions this conclusion, and at the same time endeavors to show that a vacuum is a good conductor of electricity. According to his views, the resistance offered to the passage of electricity occurs at the electrodes, and this increases with the degree of rarefaction, and disappears entirely with the suppression of electrodes. It would appear, as the result of exact experiments, that the maximum intensity of a current passing through a rarefied space is not due to the resistance of the air increasing with the rarefaction, but to the fact that the electromotive force of the spark and this air resistance possess their maximum value. When the rarefaction is carried to a greater degree, the resistance of the air column diminishes, while the electromotive force increases. In certain experiments made without electrodes, Mr. Edland has been able to produce luminous effects in gases rarefied to a degree sufficient to interrupt the current when electrodes are used. This result would of course be impossible if the rarefied gas were an insulator. We have no doubt that further details from Mr. Edland will be received with interest by scientists.

Telephone Fire Alarms.

In THE ELECTRICAL WORLD of Oct. 13 we republished a statement from the Boston *Manufacturers' Gazette*, giving to Mr. Richard O'Brien, of Scranton, Pa., the credit of first utilizing the telephone exchange as a headquarters for sounding a fire alarm when notified by a person connected with it. This statement was followed up by a letter to us from Mr. G. W. Foster, Galveston, Texas, claiming priority for the system given to Houston, Tex., on April 30, 1883, by the Southwestern Telephone Company. Then in our issue of the 17th inst. came a claim of priority from Saratoga, N. Y., a correspondent there saying that H. T. Downs introduced the system at Dover, N. H., in 1882, but this was eclipsed by the claim of Mr. E. M. Wilson, from Worcester, Mass., that gentleman stating that the same arrangement has been in use there since June or July, 1879. This week we publish a letter from Mr. Geo. B. Eagle, of Davenport, Ia., claiming that a complete system of the kind was inaugurated in the city of Burlington, Ia., in 1878. That takes us back a good way, and it now remains for some one else to "beat the record." We also publish an interesting letter on the subject from Meadville, Pa., and another from Havana, Cuba, that names January, 1877, but about which there might be greater clearness of detail of historical statement.

THE SIEMENS FAMILY.—In another column we have performed the sad duty of recording the death of Sir Charles William Siemens, and giving an account of his illustrious career. He was a member of a family that has made a deep impress on the scientific invention and research of the times. The father, Ferdinand Siemens, had eight sons, of whom at least five have risen to distinction. These five are Werner, the eldest, who was born in 1816, and is known as the "Berlin Siemens", Charles William, the subject of our obituary notice; Frederick, known as the "Dresden Siemens"; Carl, head of the St. Petersburg branch of the famous Siemens firm, and Hans, a man of great fecundity of invention. A few brief notes on this talented brotherhood appeared in THE ELECTRICAL WORLD of the 10th inst. We have now endeavored, in spite of the shortness of available time, to collect the facts belonging to the career of Sir Charles, and to present them in this issue. We also give of the great scientist a portrait which, we believe, does him justice.

THOSE BOGUS CABLE DISPATCHES.—In our editorial notice of last week, we said that although the Central News Association had not, so far, succeeded in its action against the *Sportsman* for libel, it was probable that the case would be revived in some way. It was not likely that the Association could allow itself to be attacked so seriously in so vulnerable a point. But the offending paper has again provoked the fight itself. A dispatch from London of the 20th says that at the Central Criminal Court, the Central News applied to have certain alleged libels which have appeared in the London *Sportsman* since the dismissal of the summons for libel last week added to the indictment. The Recorder ordered the matter postponed until counsel for the *Sportsman* could be heard. A further dispatch of the 21st says that the Grand Jury in the case of the Central News have found a true bill for libel against *Judy*, but have ignored the bill against the *Sportsman*. The Central News renewed its application to the Central Criminal Court on the 21st to have alleged libels which have appeared in the *Sportsman* since the dismissal of the summons for libel added to the indictment. Mr. Williams, counsel for the *Sportsman*, opposed the application as being of a frivolous nature, and the Recorder refused to grant it.

Reis, "Parent" of the Telephone.

To the Editor of The Electrical World:

Sir: Mr. Berliner, has given me, in your issue of October 6, which has just reached me, a very neat rejoinder, containing a number of interesting points. To ask space to reply to all of them in your columns would be to ask too extensive a favor at the hands of even the most gracious of editors. Therefore, lest I occupy too large a space in your columns, I propose to leave some of the less important of the issues to answer themselves, and will address myself to the main points now in debate.

Mr. Berliner promises to "lay bare Reis' methods" (methods—observe—not method) of transmitting undulations by the telephone; but on examining the results emanating from his weapon—shall I call it tomahawk?—by which the process of "laying bare" is accomplished, I cannot find that he has done very much more than dig up a rather obscure passage about—no, not about a transmitter at all—about one of the receivers invented by Reis—the "knitting-needle." He comes to the conclusion, by looking at this passage in the description of a *receiver* that the *transmitter* was not intended to transmit all that such a receiver could receive; but that it was only intended to transmit "one half" of the undulations. Well, though the argument is rather mixed in its logical sequences, I am thankful even for the admitted "one half," and I congratulate Mr. Berliner on the fifty per cent. of undulations which he credits to this particular instrument of Reis. I will return to the remaining "half" presently.

Meantime, I would ask Mr. Berliner why, in his process of "laying bare" Reis' methods, he confined his attention to one form only of the receivers of Reis? It so happens that Reis invented another form of receiver, most minutely described by Inspector Von Legat in his report on Reis' instruments. Why is the action of *this* receiver not to be considered equally important? In this other instrument there was an electro-magnet, and opposite its poles an iron armature, electrically mounted, and attached to a sounding-board. The action of the apparatus was thus announced:

"The electro-magnet will be demagnetized and magnetized correspondingly with the condensations and rarefactions of the mass of air contained in the tube (of the transmitter), and the armature belonging to the magnet will be set into vibrations similar to those of the membrane of the transmitting apparatus."

Do these words not "lay bare" something quite different from Mr. Berliner's suggestion that Reis intended to let the transmitter "do" one half of the undulations and the receiver the other half? Mr. Berliner says: "In the modern system the transmitter does the whole, and *the receiver merely follows faithfully;*" but, surely, "following faithfully" can only mean that the armature of the receiver is set into vibrations similar to those of the tympanum in the transmitter, and that is precisely how Reis described the action of his receiver, as just quoted. It is perfectly clear that, in *this* form of instrument at any rate, the receiver was to receive the whole of the vibrations—not "one-half"—and therefore it follows that the transmitter was to transmit the whole of them.

But I come back to the "other half," which Mr. Berliner hesitated to credit to Reis when he used the "knitting-needle" receiver. Mr. Berliner bases his view upon a passage which he cites from Reis himself. I will quote the same identical passage, word for word, in order that I may explain the points he has missed. Reis in this passage is endeavoring to explain how the varying interruptions of the current can make such a needle vibrate; and he takes a simple case in illustration:

"But at every closing of the circuit the atoms of the iron needle lying in the distant spiral are pushed asunder from one another. At the interruption of the current the atoms attempt to regain their position of equilibrium. . . . . But if these actions follow one another more rapidly than the oscillations of the iron core, then the atoms cannot travel their entire paths, the paths traveled over become shorter and shorter the more rapidly the interruptions occur, and in proportion to their frequency."

Those are the words Mr. Berliner quotes. Let us see what there is in them. First, Reis recognized that the iron or steel of the needle was made up of atoms, and that since the material possessed elasticity its atoms could be made to oscillate backward and forward. He also recognized that the iron needle had a tone of its own, in emitting which the oscillating atoms would have to oscillate with a certain frequency of motion; but that it was also possible for them to oscillate in longer or shorter paths, and in paths of longer or shorter duration, provided certain actions which were brought to bear upon them occurred more or less frequently than their own natural frequency of oscillation. He further remarks that if these impressed actions occur more rapidly or frequently the atoms will not swing over such long distances; they will execute short, quick vibrations instead of long, slow ones, in which case they will not travel their "entire paths." I cannot find in the passage from Reis one single word about "back-strokes" of the molecules, which Mr. Berliner seems to have found in this passage of Reis' memoir. It distresses me to say that I can't find anything of the sort even hinted at. I don't find anything about molecules striking, either against themselves or against anything else; much less that they have any "back" strokes. They swing through longer or shorter paths, and swing quicker or slower according to circumstances.

I will ask Mr. Berliner kindly to allow me one moment's grace to "lay bare" the action of the Bell receiver of the common kind. The vibrating or undulating current comes along the line from the transmitter into the "distant spiral" coil upon the pole-piece of the receiver; that pole-piece in consequence acts, with corresponding fluctuations in its attraction, upon the atoms of the iron tympanum. That tympanum has, like all tympanums (and like the iron needle too), a natural note of its own—a *booming* note, if the tympanum be thin in proportion to its diameter. The iron is elastic; its atoms can oscillate, and can travel along paths of their own. But if the fluctuations of the current impress upon those atoms magnetic impulses with a different frequency, if the fluctuations of the current came more rapidly, one after the other, than the natural swing of the iron atoms, then those atoms comprising the disk oscillate with a corresponding frequency of note, and travel in paths of longer or shorter length and of longer or shorter duration. If these fluctuations in the transmitted current "follow one another more rapidly than the oscillations due to the elasticity of the iron" of the diaphragm—that is to say, if the transmitted sound is one of shriller pitch than the natural note of the elastic iron tympanum, "then the atoms cannot travel their entire paths;" the paths traveled over become shorter and shorter the more rapidly the fluctuations occur, and in proportion to their frequency.

Why, when we "lay bare" the action on the iron atoms of the diaphragm of the Bell receiver, it turns out that, so far as any question of oscillation of atoms is concerned, the effect of frequency in the fluctuations of the current is absolutely identical with the effect of frequency in the fluctuations in the case of the iron atoms of the Reis' needle! Given a fluctuating current, it will produce a corresponding fluctuating magnetic attraction on a neighboring atom of iron, no matter whether that atom of iron be part of an elastic iron needle or part of an elastic iron disc. Both can vibrate, both will vibrate, and the duration of the oscillations will be shorter in proportion to the frequency.

I say then, most emphatically, that Reis, in describing the action of the current on the oscillations of the atoms of iron had penetrated to the very heart of the matter; and the passage quoted by Mr. Berliner is the most convincing proof of it. I assure Mr. Berliner that he need not any longer hesitate to credit Reis with the "other half" of the undulations. He has admitted that Reis intended to transmit fifty per cent. of the vibrations by an undulatory current. If Reis invented an instrument to work by undulatory currents for fifty per cent. of the vibrations—as Mr. Berliner admits—then, I think, he must be regarded as the inventor of undulatory current transmission, even if the other fifty per cent. be otherwise transmitted.

Having disposed of this point, I turn to another. Mr. Berliner quotes from Reis' prospectus—a document which specially gives instructions how to indicate to the person at the transmitting end when he is to "speak"—the following scrap:

"The circuit will be once opened, and again be closed for each full vibration," and upon the strength of this "decisive language" he seems to think it proved that I am wrong in maintaining that Reis meant his "interrupter" to work by varying contact. According to Mr. Berliner, Reis did *not* intend his interrupter to interrupt the current in proportion to the vibrations; but to act in a manner that did not correspond to the vibrations at all. According to Mr. Berliner, a gradual vibration was *not* to interrupt the current gradually, a partial vibration was *not* to interrupt the current partially. And this is the sentence he quotes as a proof of his view! Well, what does the sentence say? It does not refer to the complicated vibrations of speech, to the regular undulations of the vowels, or to the abrupt agitations of the consonants. It does not even refer to the transmission of gentle musical chords. It is a much simpler case—the simplest conceivable. Reis, wishing to bring the very simplest case to the conception of an incredulous folk who would not believe that even a simple musical sound could be electrically transmitted, takes them to the instance of a single to-and-fro oscillation. He tells them what will happen in the case of a "full vibration." That is all. He says the circuit will be once opened and again closed for every *full* vibration. He had previously said—or he had got Inspector von Legat to say it for him—that the contact-piece of his transmitter must "follow" the movements of the tympanum of the transmitter with the greatest precision, or else the sound would be blurred in transmission. And he knew, and gave diagrams of curves to show that he knew, how complex were the vibrations of various sounds which his transmitter was to transmit. He drew diagrams of undulatory curves not consisting of "full" vibrations but of vibrations of other kinds—gentle gradations of pressure being indicated by gentle slopes in the curves. All these his contacts were to "follow" precisely. He told the world what was to happen at each "full" vibration; he did not add in any explicit manner what was to happen at any half vibration or partial vibration. He left it to the common sense of mankind to see that if a "full" vibration

opened and closed the circuit, a half vibration must half open and half close the circuit. It is absolutely certain that in the lever form of instruments he meant the amount of opening and closing—the degree of interruption—to be proportional to the motion of the tympanum of his transmitter, for if it were not proportional the result would have violated the principle he so emphatically laid down, that the electro-magnet of his receiver was to be magnetized and demagnetized in proportion to the degree of condensation or rarefaction of the air in the transmitter. I cannot conceive any person of ordinary understanding reading the statement of this fundamental principle and not seeing that this could not possibly be so, unless the opening and closing of the circuit by the interrupter of the transmitter were an opening and closing strictly proportional in degree to the vibrations impressed by the speaker's voice. He intended his circuit to be closed in proportion to the air pressure. He intended his interrupter to interrupt in varying degrees corresponding to varying amplitudes of vibration. He never explicity said so; he never seemed to think that any one would or could be so devoid of logical capacity as to require such elaboration of language. To have supposed otherwise would have been to violate the fundamental principle of *correspondence in the vibrations*. Once the principle of correspondence laid down as Reis laid it down, common sense would show that a *partial* vibration must produce a *partial* interruption of the current, or it could not reproduce the *partial* vibration in the receiver. All that any modern transmitter does—Blake, Edison or any other—is to interrupt the current in proportion to the vibrations.

Read Reis, unbiassed by later ideas, read his fundamental principle of "correspondence," as I call it. Apply it as a fundamental principle to interpret his meaning, and that meaning is perfectly clear.

The failure of Reis to obtain all the complete results he hoped for—and he was one of those single-hearted men who honestly avow the imperfections of their own work—was not due, as Mr. Berliner thinks, to the falsity of his system. Mr. Berliner says it was "solely" due to the falsity of his system! No. He failed to obtain results as reliable as he desired, because his instruments had mechanical imperfections which prevented them from coming up in their performance to the perfect "correspondence" in action which Reis's theory laid down.

Did Reis lay down that theory of correspondence as a fundamental principle, or did he not? Any one who has read Reis's papers knows.

I fear I have already trespassed too long upon the editorial fund of patience, and I dare not linger on the other minor points at issue. But I cannot lay down my pen without expressing my thanks to Mr. Berliner, firstly, for having so squarely raised the main issues, and secondly, for having given me at the end of his letter such an exquisite little "*parable*" in illustration of his view of the case. It is so apt, so delightfully apt, that I shall treasure it. Let me revive it here.

"A child born in the wilderness loses his parents when he is not capable yet to intelligibly utter his wants. When quite grown and in his wild condition he is picked up by a person of intelligence who succeeds in teaching him how to talk and to learn, and he subsequently becomes a highly useful citizen of the State. To whom is the State most indebted?"

Let me "lay bare" this little parable. The child born in the wilderness had no natural impediment. He was not physically incapacitated from speaking, he inherited the organs of speech from his parents, but they were dead. He had a tongue made right, and lips and lungs. His organs of speech were so constructed that when rightly operated they could produce those undulatory motions of the air which we call speech. They were indeed made for that purpose. He had even learned to utter a few familiar words in his youth before his parents died; and when he sang songs the words were recognizable, said those who heard him. But, after his parents' death, he spoke to nobody simply because nobody spoke to him. His incapacity was not due to any imperfection in his own design or structure, or to any falsity in the system on which he was constructed. His lips were not so made that they must always be either wide open or tight shut. They could be half open or a quarter open; they could open in any proportionate degree corresponding to the amount of muscular effort applied to open or close them. His ears, though clumsy, were perfect; the elasticity of their membranes (or drumskins) was such that the atoms could execute vibrations to and fro, and could travel on longer or shorter paths according to the forces acting on them. In short, his imperfections were solely due to disuse. People did not know or had forgotten his existence. Now comes the "person of intelligence;" I would have preferred to say a man of insight and genius. He teaches the creature to talk and to learn. It is deeply touching. That man has deserved well of his country. He is a public benefactor. The parable is perfect.

Only one detail remains. Mr. Berliner asks: To whom is the State most indebted—the dead parents or the man of insight? Pardon me: that is *not* the question. The question is: *Who was the parent?* Yes; the parable is perfect.

Only it stops short too soon. Let me take up my parable where Mr. Berliner lays his down. This is my parable:

"The State, having discerned what a great benefit had been conferred upon it by the person of intelligence in teaching the neglected child to talk, made a solemn decree to the effect that henceforth, for fourteen years, no man, woman, or child in the entire State should be allowed to become the parent of a child except the aforesaid person of intelligence."

SILVANUS P. THOMPSON.

BRISTOL, Oct. 26, 1883

Telephone Fire Alarm Priority.

To the Editor of The Electrical World:

SIR: I notice in your issue of Nov. 17 some claims to "Priority of Telephonic Fire Alarms." Worcester, Mass., is undoubtedly ahead; but we must put in our claim dating back to July, 1881, at which time every telephone connected with our exchange was numbered, commencing with 12, skipping 20 and 22, 30 and 33, etc., making numbers that could be struck on City Hall fire bell, which is located only about 200 feet from our central office, and is connected by a wire cable which easily works a lever-work bell-striker made for that purpose, so that when an alarm of fire was sent in by the telephone, the number of the telephone sending it, or of the one known to be in nearest locality of the fire, was struck on the fire bell instantly, and repeated several times. A subscribers' list card, with numbers of each fire station thereon, was posted at every telephone in all engine houses, and in nearly every business house, so there was no trouble in knowing instantly the immediate location of all fires.

This system was a perfect success: but our city fathers have always felt too poor to equip the engine house with telephones, although they are just now investing in the Fuller system of electric light for all streets. It is put in on trial for a year. H. C. BEMAN.

Dist. Supt. Telephones.

MEADVILLE, Pa., Nov. 19, 1883.

To the Editor of the Electrical World:

SIR: In your issue of the 3d, I notice a letter from G. W. Foster, Galveston, Texas, regarding who should have credit of the first introduction of the telephone as a practical fire-alarm system. Our friend from the "Lone Star State" is about five years too late in arranging the system in Galveston to lay claim to being the first to thus apply the telephone.

In 1878 I inaugurated a complete system of fire alarm in the city of Burlington, Iowa, and since that time the telephone has furnished that city with a system they have under their own control and would not exchange for any other now extant. It has given complete satisfaction to city officials and the fire department.

GEO. B. ENGLE, JR.

DAVENPORT, Iowa, Nov. 13, 1883.

To the Editor of The Electrical World:

SIR: Contesting priority claims in electric invention and introduction is the fashion just now. In your issue of the 3d of this month Mr. G. W. Foster, of Galveston, Texas, under date of Oct. 18, 1883, claims that if the North Pennsylvania Telephone Company did not set up the "telephone fire-alarm system" previous to April 30, 1883, said Mr. Foster would modestly enter a mild protest.

I now come to do the same, and say that if any one used the telephone fire-alarm system previous to January, 1877, I should believe claim some advance on Mr. Foster.

I remit you by this same mail a pamphlet of the fire department here, giving you full explanation. I will also add that when a station communicates to central station an alarm of fire, it is returned in by central in one minute to all the stations in the city who give the alarm out to police and firemen, spreading the alarm over the city in less than 1½ minutes. Our department is a volunteer.

Yours, very truly, HENRY B. HAMEL,
Second Chief and Superintendent of Fire Department.

HAVANA, Nov. 17, 1883.

The New England Weston and the Edison.

The New England Weston Electric Light Company of Boston publishes a letter from Grant Brothers, of Olneyville, in refutation of the following charges made by the Edison Company, in a circular dated last July, and recently brought to the attention of the Weston Company:

"*Rhode Island.* * * * * * Grant Bros., Olneyville, R. I., bought a Maxim plant because we would not contract to install our plant within a given period, which did not give us sufficient time to do it properly. The Maxim people agreed to do it and start on the day named, January 1. The order was given to the Maxim people; the 1st of February came and the mill was not wired, but we believe the mill has since been lighted. The manager stated that he knew the Edison Company had many skilled scientific and practical men in their employ, but he did not meet one in the Maxim Company. He has two machines, but they are not paid for, and will not be until a test is made, which, if the test is properly made, will prove fatal to the Maxim guarantee." * *

Grant Brothers say these statements "are liable to give an impression exactly the reverse of the truth." Their reason for giving the Maxim machines the preference, they add, "was *not* because we could not get an Edison machine at the required date, January 1, 1883. On the contrary, we have a letter from the Edison Company's agent dated November 8, 1882, offering, on receipt of an order within a week, to install the machine by January 1, as desired. We had, however, unknown to either company, compared the operation of the Maxim and the Edison lights in the Boston exhibition of last year, afterward in the plants operated in Rhode Island. We chose the Maxim solely because from observation and report we concluded that it was the best machine in the market, as regarded life of lamps, quality of light, and the regulating capacity and general durability of the machine.

"Our subsequent experience has confirmed our first judgment, as you will discover upon reading the report of our six months operation of your machines, shortly to be made to the R. I. Company.

"In regard to the alleged delay on your company's part in furnishing the machines, we will state that your dynamo was in our works several weeks before we were ready with the shafting, and the wires were promptly strung in advance of our needs.

"The two machines were fully started April 2d and 30th respectively. We felt sufficiently well satisfied to make a payment on account April 14th, and both machines were fully paid for in July, without any discount or rebate. The result of our test during about 1500 hours since April, instead of proving 'fatal to the Maxim guarantee' has been far in advance of the guarantee, and very satisfactory to us. In short, we regard the Weston-Maxim system of incandescent lighting as the best of which we have any knowledge."

The New England Weston "respectfully suggests" to those likely to be interested in the subject that they receive with caution any statements concerning the Maxim incandescent system which may be made by the opponents of the company.

Upon inquiry at the Edison Company's office, 65 Fifth avenue, this city, a representative of THE ELECTRICAL WORLD was informed that the New England agent of the company had prepared a statement contradictory of the above, and that, if possible, a copy would be sent to this office in time for this issue. The copy has not yet come to hand, and we shall not, therefore, be able to publish it until next week.

The Electric Light.

In Cincinnati on the 9th inst. Professor T. C. Mendenhall, of the Ohio State University, delivered a lecture before an audience of six hundred persons on "The Electric Light." Professor Mendenhall occupies the Chair of Physics in the Ohio State University at Columbus, and formerly held a similar position at the Imperial University at Tokio, Japan. Additional interest was lent to the lecture by the fact that Dr. Mendenhall was chairman of the jury that decided upon the merits of the electric light test at the late Cincinnati Exposition, and whose decision in favor of the Edison light was followed by a suit brought by the United States Company for $50,000 damages. In the numerous illustrations of the lecture, which were projected upon a large square of canvas, the lecturer was ably assisted by Mr. A. L. Rohrer, also of the Ohio State University.

In introducing his subject Professor Mendenhall referred to the incident that some Coreans recently had visited this country and paid a visit to the works of the Western Union Telegraph Company in New York. One of these had taken his note-book and marked down his impressions of the machinery. In sheer astonishment he had asked the question: "What is electricity?" and when the answer was given he expressed himself to be as ignorant of the subject as before. And so while the nature of electricity was known to some extent, it was principally recognized by its effects. He could define it as "a vehicle by which energy is transmitted."

In continuing his lecture he first developed the subject of the fields of force, and projected several magnets on the screen. He next produced the electric current by cutting the lines of force. The next illustration was cutting the lines of force by means of copper wire coils. He gave the different sizes of the carbons used for the Maxim incandescent lamp and the Edison lamp. The three sizes given for the former were: cardboard, width .028, in thickness .007; carbonized, width .0212, in thickness .0047; heated, width .0214, in thickness .0051. The sizes for the Edison lamp were as follows: bamboo, width .013, in thickness .008; Edison, width .009, in thickness .004. Both lamps and different carbons were delicately illustrated on the canvas.

The third series of his experiments was illustrative of the electrical currents produced by a thermo-pile. He also gave the relative cost of producing light by means of electricity and gas. He confessed he knew nothing whatever of the cost of gas as manufactured. This was a profound secret with the manufacturers. But the cost of gas, as he had calculated, was about ten cents per hour, and the cost of electricity was only a quarter of a cent during the same time. And if to the cost of electricity one hundred per cent. were added on the investment, another hundred per cent for other things, and as much more electricity would still be cheaper than gas. Hence he predicted that electricity would supersede gas, and not only for general purposes, but for household use. Electric light would be the illuminator of the future.

(*Continued from page* 204.)

involved in an exchange system of 500 lines operated at' ten tables of 50 each, we see that the "fault" is more than pardonable.

The connections between different tables and between different exchanges are the great bugbear of the telephonist. This switch-board is, therefore, a valuable improvement, in that it reduces the number of tables, by condensing or rather concentrating the work—and the operators, aside from the great advantages and the convenience which follow from the smaller space required. With this table four operators can easily take care of the 500 subscribers in their charge. But take an exchange of the same number of lines, with ten tables and ten operators, and the chances are that, with her own fifty to look after and the calls from nine other tables besides, each operator will have all she wants, and, of course, the more the tables are multiplied as the exchange increases in size, the greater the "rush" now and then, until finally it becomes necessary to diminish the number of lines to each table, as has been done in some exchanges. The four operators grouped together, on the other hand, have *no* trunk lines to look out for, and if one of them gets "rushed" the others are there ready to help.

The method of making connections between lines situated on two different tables or in two different exchanges with this switch-board is also very interesting on account of its simplicity. In this case three of the operators attend to the calls of subscribers on their own switch-board, and the fourth answers calls coming on the trunk "call wire" from other switch-boards. At each of the four corners of the switch table is seen a projection carrying the switch buttons, by means of which each operator can loop her telephone apparatus into a call wire. These buttons are numbered or lettered to correspond with the tables. In the figure there are ten shown. This is enough for eleven tables, since this table itself does not need any switch corresponding to its own number. An operator wishing to connect with table *B* (or 2) presses button *B*, and the switch, which is identical with that shown in the diagram, loops her telephone into a circuit which passes through every one of the eleven tables but which is grounded at table *B* after passing through the telephone of the call-wire operator, who keeps listening constantly for calls. If the button marked *C* were depressed then the telephone would be looped into a circuit, also passing through all the *C* switches at every table, but abutting at table *C*, passing through the telephone of the call-wire operator at this table. Thus with every button. It is plain therefore that an operator at any table can talk to the call-wire operator at any other table. The call-wire operator only *receives* calls, and makes connections accordingly. He does not send orders to other tables, for the reason that he does not answer the calls at his own table. The connections between tables may be made by connecting the trunk lines between certain tables to corresponding strips, or else by connecting them to corresponding tubes as if they were regular lines. This is a very convenient way. Suppose now that subscriber 45 on table *A* wishes to communicate with subscriber 1415 on table *C*. One of the three operators at table *A* having ascertained this want in the manner explained above, she places plug 45 into one of any pair of connecting strips that is not occupied. She then takes up the plug from the trunk line to *C* and inserts it into the other strip of the pair. She then presses button *C* at the corner and informs the call wire operator at *C* that 1415 is to be connected on this trunk line. The latter picks up plug 1415 and the trunk line plug, and connects on a pair of strips. By this method a clearing out annunciator is included at both tables, and the signal to disconnect is received at both places simultaneously. This is certainly a very simple, prompt and satisfactory method, and one which, it seems to us, offers less disadvantages than any of those adopted with other switch-boards.

This switch-board possesses evident merits that will suggest themselves to all practical telephonists without further prompting, and we believe that the two which have been recently sent to Philadelphia will speak for themselves as the heralds of their own advantages, after a brief practical career.

In conclusion, we have to acknowledge courtesies from Mr. Wm. A. Childs, manager, and Mr. Frank Shaw, engineer, of the Law Telegraph Company, in furnishing us the necessary information for this article.

The Wheatstone System.

The meeting of the New York Electrical Society on Friday evening, November 16th, was well attended, and included a goodly number of persons prominent in various branches of the science of electricity. Among them were Prof. P. H. Van der Weyde, of the Cooper Institute, and Dr. N. S. Keith.

After the transaction of routine business, the lecturer of the evening, Mr. S. P. Frier, Manager of the Wheatstone department of the Western Union operating room, was introduced, and read a very interesting paper on the "Wheatstone System of Automatic Telegraphy."

Mr. Frier began his subject with a brief sketch of all the automatic systems which have been and are now in use by the various telegraph corporations. Bain's system, which was invented in the year 1846, was the foundation of successive systems—good, bad and indifferent. This system was experimentally tried in this country in 1848-49, but was abandoned for various reasons. An Austrian, Dr. Gintl, followed Bain with a system somewhat similar. In 1853 Siemens and Halske, of Berlin, bought an automatic process and equipped lines in Russia with it. It was subsequently superseded by the Morse system. The difficulties encountered in this system led to the introduction of the Siemens polarized relay. This firm and others made innumerable experiments in automatic telegraphy, but not until the advent of the Wheatstone system was anything of a reliable nature produced. "It was during a visit to Paris," said the speaker, "that in watching the performance of a Jacquard loom (in which the threads are controlled by perforated cards), it occurred to Sir Charles Wheatstone that if the mechanism of a loom could be so regulated, why not electricity? This idea," continued the speaker, "was immediately worked out, and in 1858 he took out his first patent for what is now so well known as the 'Wheatstone system.'" Its working parts consist of a perforator, in which the paper is prepared for the transmitter; the transmitter, which uses the perforated paper for the purpose of transmitting the currents of electricity, and the receiver for recording upon paper the results of such electrical transmissions.

The speaker then described in detail each instrument, using diagrams to illustrate special parts of the mechanism not well understood by a mere verbal description.

The development of the Wheatstone system in Great Britain and Ireland during the past five or seven years has been the most rapid of any system, and now all the circuits are worked at an average speed of 200 words per minute. It is growing in favor on the Continent. The Minister of Postal Telegraphy in France has established at the central office a special course of lectures on Wheatstone's automatic apparatus, to which competent operators are admitted.

"One of the great uses to which this system is particularly valuable," said Mr. Frier, "is that of working extremely long wires. Experiments are at present carried on in working the system duplex on a wire 1,000 miles long, through one repeater, and the speed attained is an average of nearly 150 words per minute—an equivalent to 600 messages per hour, 30 words per message. It is just a question of time when it will be working quadruplex. Like all other systems that have for their object the disposal of many messages over one wire, the Wheatstone requires skillful handling and the repeaters have to be under the control of experienced electricians to obtain their full working capacity. A skilled mechanician is also an important requirement in this system. The Western Union have in their employ one of the best they could get from England. Another great advantage of the system is that the paper for receiving does not require any preparation after leaving the hands of the manufacturer."

In conclusion, Mr. Frier stated that every town in England which has a morning newspaper has a Wheatstone circuit. London is the fountain head of the service, and an average of one million words per night are handled there. One punched slip will feed as many transmitters as necessary. Three slips are often punched at once by the perforator, thus supplying matter for three separate wires.

There is no political, congressional, or other public meeting that has not a trained staff of Wheatstone operators. Every race meeting has its Wheatstone staff, without which at such places as Epsom, Lincoln, Newmarket, etc., the business could not be handled—at the former on Derby day 5,000 or more dispatches are handled within an hour or so of the result of the race.

A complete set of the apparatus, which had been placed on the platform for the occasion, was then put in actual working order and examined with evident satisfaction and pleasure by the members. The scene was a lively one for a time, resembling a junior telegraph office. The beautiful workmanship displayed in the finish of the instruments elicited general expressions of admiration.

The next meeting of the society will be held on Friday evening, Dec. 7, at which Mr. P. B. Delany, of Philadelphia, will deliver a lecture on "Synchronous Multiplex Telegraphy." This is the system recently invented by that gentleman, and given much publicity through the daily press.

Mr. Edison and Storage Batteries.

The publication last week of Mr. Edison's contradiction of the London dispatch announcing that the Edison Electric Light Company had purchased the right to the Faure-Sellon-Volckmar accumulator for Germany, led Mr. J. I. Courtenay to telegraph to London for information. The Faure-Sellon-Volckmar accumulator is owned by the Electrical Power Storage Company, of London, and Mr. Courtenay represents their interests in this country. He knew that his company had been negotiating with the Edison Company in Germany, but did not know that arrangements had been completed. He received a dispatch asserting that the rights had been sold to the Edison Company. He supposed that Mr. Edison did not keep close track of the companies doing business under his name throughout the world, though in due time he would undoubtedly hear of this arrangement through the mails. Mr. Courtenay said that electricians fully as well-informed as Mr. Edison believed the storage battery to be a success. The Messrs. Siemens are interested in the German company. Sir. C. W. Siemens admitted that secondary batteries had come into practical use, and the improvements in their manufacture made them available for a great length of time.

The Armington & Sims Engine.

In our last issue we were unable to find space at the end of the article on steam engines for dynamos, taking the Armington-Sims as our first type, to mention the facts that go to show the popularity of the engine in question with electric lighting companies. Last September we made a brief note on the subject, however, in No. 4 of the present volume. Since then we have learned that up to the end of September the company had built no fewer than 135 engines for Mr. Edison, and as many as 22 for Mr. E. H. Goff, president of the American Electric & Illuminating Co. Their product last year was 108 engines; now they are turning out 16 every month. Not only the Edison Company, but the Brush and Weston, are among their patrons. We learn, too, that the compound condensing electric light engines built by Mather & Platt, Manchester, England, on board the steamer "Oregon," have the Armington-Sims automatic cut-off and balanced valve.

THE TELEGRAPH.

THE SOUTHERN TELEGRAPH CO.—A dispatch from Augusta, Ga., of Nov. 20, says that the Southern Telegraph Company's line has been completed to that city, and is working with Richmond, Baltimore and intermediate places.

AMERICAN RAPID MORTGAGE FOR $3,000,000.—The American Rapid Telegraph Company, organized in the States of New York, Massachusetts, New Jersey, Pennsylvania, Maryland and Ohio, has placed on record at Warren, O., a mortgage to the Boston Safe Deposit and Trust Company. The mortgage is to secure bonds to the amount of $3,000,000, issued for the purpose of extending the company's line so as to cover the central Western States. The bonds are for $1,000 each, bearing 6 per cent. interest, payable semi-annually, and they mature in 1893.

THE BANKERS AND MERCHANTS' CO. IN OHIO.—A despatch of the 16th from Cleveland, O., states that articles of incorporation of "The Bankers & Merchants' Telegraph Company" have been filed with the Secretary of State. The capital stock is $20,000 in shares of $100 each, with John B. Yale and Jeremy Crosse, of New York, and Henry H. Brown, Charles A. Brayton, and Julius L. Yale, of Cleveland, as incorporators. The articles state that they will construct and operate telegraph lines from the city of Cleveland, which place shall be the central terminus of said lines, as follows: One line to the city of Columbus and thence to the city of Cincinnati; other lines to the city of Toledo, village of Conneaut, city of Youngstown, town of Bridgeport, and the town of Winchester, passing through the Northern counties.

TELEGRAPHIC CONSOLIDATION.—The regular annual meeting of the American Rapid Telegraph Company was held on the 20th at the company's New York office. Messrs. Jordan L. Mott, J. W. Converse and Frederick H. May, were elected directors without opposition, 39,500 shares of capital stock being voted out of 40,000. Messrs. Converse and May are directors at present. Mr. Mott goes into the board in conformance with the plan by which the American Rapid is to be controlled hereafter by the Bankers and Merchants' Telegraph Company, which has also absorbed in the same way the Southern Telegraph Company. The three systems are to be worked as one, in opposition to Western Union.

Mr. J. W. Converse, was on the same day re-elected president of the American Rapid, and Mr. J. C Case, president of the Bankers and Merchants', was made treasurer.

THE POSTAL TELEGRAPH COMPANY REORGANIZED.—A meeting of the stockholders of the Postal Telegraph Company has been called for Saturday, Dec. 1, "to consent by a formal vote to the sale of their property, rights and interests" to the Postal Telegraph and Cable Company. George R. Williamson gives public notice that already more than three-fourths of the stockholders of the Postal Telegraph Company have consented in writing to the sale, in accordance with the terms of an agreement dated Nov. 3, 1883. The Postal Telegraph and Cable Company was incorporated, about the middle of last month, by Henry C. Gardner, Luther R. Marsh, Andrew W. Kent, Dumont Clarke and T. H. Duprey. The amount of its capital stock was placed at $1,500, with the privilege of increasing it. At the time the articles of incorporation were filed Mr. Gardner said: "Our charter has been made as comprehensive as possible, and we hope to combine under it nearly all, if not all, of the telegraph companies outside of the Western Union." The Postal Telegraph Company has already conveyed to the Postal Telegraph and Cable Company, by an instrument recorded in the Register's office Nov., 20 all its telegraph lines, extending from this city to Chicago, its franchises, etc. The document recites that, in consideration of $10,498,500 in full-paid shares of the capital stock of the Postal Telegraph and Cable Company, of the par value of $100 each, the Postal Telegraph Company has executed this conveyance.

THE TELEPHONE.

THE ATLANTA TELEPHONE COMPANY.—This company, under the management of Mr. H. H. Jackson, has 309 regular subscribers.

FROM BANGOR (ME.) TO CORINTH.—A telephone line between Bangor and the town of Corinth is talked about. Such a line would be a great convenience.

GREENFIELD, MASS.—A new list of subscribers has been published by the Greenfield Telephone Exchange, which includes now about seventy-five subscribers, besides about the same number connected with the North River line.

ANOTHER USE FOR THE TELEPHONE.—Telephonic communication has been established between Alpnach and the hotel on Mount Pilatus, Switzerland, so that tourists may ascertain the state of the weather on the heights before making an ascent.

PITTSBURGH, PA.—The Central District Telephone Company has just completed a line to East Liverpool, Ohio, fifty miles distant, which works excellently, and Manager Metzgar is now looking wistfully toward Wheeling, seventy miles away.

THE ROCKY MOUNTAIN COMPANY.—This company, of Ogden, Utah, have declared their fifth monthly dividend for November of 50 cents per share, payable immediately. They have added to their surplus and expect to pay a quarterly dividend at the rate of 10 per cent. from Jan. 1, 1884.

VILLAGES IN MAINE UNITED.—The National Bell Telephone Company will unite the three villages of Paris Hill, South Paris and Norway in one telephone exchange, and give connection with Mechanic Falls, Lewiston and Portland, if there are thirty subscribers in the three places combined who wish to rent instruments.

"FROM CHINA TO PERU."—There are now 161 cities in Europe where telephones are in use, having a total of 30,066 subscribers. In Asia there are 7 with 420 subscribers; in Africa, 4 with 240; in America, 126 with 47,105 subscribers, and in Australia 4 with 897. The average subscribers in America for every town are 378, against 187 in European cities.

THE TELEPHONE IN MEXICO.—It is said that the Mexican government is interesting itself in the telephone and building lines for the Mexican Telephone Company without costs to the latter and at the same time paying a royalty for the instruments used. The earnings are now largely in excess of operating expenses, but the surplus for the present goes into construction. The company is out of debt and has a working surplus in the treasury.

TELEPHONE PATRONS THREATENING TO STRIKE.—At Logansport, Ind., last week, a petition was circulated by the Retail Grocers' Association, to which the signatures of three-fifths of the telephone subscribers were secured, asking for a reduction in telephone rentals to $2 per month. There are some two hundred and sixty patrons of the telephone in the city. The cost to business houses is $12 per quarter, and to private residences $9 per quarter. The petitioners threaten to discontinue the use of the instruments after the first of January, if their appeal is not successful.

REVEALING THE SECRETS OF THE EXCHANGE.—The Milwaukee *Sentinel* kindly informs the man who goes mad when he does not get a prompt response from the telephone exchange that his fury is all in vain, and that it is useless for him to spin the crank until his arm aches, in the belief that he is filling the soul of the telephone monopoly with terror. The *Sentinel* explains: "With one turn of the crank a little shutter at the central office is made to drop; the turning of the crank does not ring any bell at the central office, and does not make the least noise. The merest touch drops the shutter, so that all subsequent ringing does no sort of good."

THE ERIE TELEPHONE CO.—The first quarterly report of the Erie Telegraph and Telephone Company, to October 1, has just been made to the president and directors by Messrs. Francis Jewett, Arthur G. Pollard and Horace B. Shattuck, the auditing committee, who find that the company earned from July 1 to October 1, 1⅞ per cent., or at the rate of 7½ per cent. per annum upon $4,800,000 of capital stock outstanding. The report is as follows: Whole number of subscribers, as shown by the official returns of division superintendents, October 1, 1883, 7,221; to July 1, 1883, 5,991; gain for three months, 1,230. Total October 1, 7,221. Number of exchanges July 1, 1883, 19, added during three months, Northwest division, 18; Southwest division, 13; Cleveland division, 0; Total added, 31. Total in operation October 1, 1883, 50. The following is a statement of the condition of the company, showing gross revenue and expenses to October 1, 1883: Assets—Construction, $4,957,164.66; expense account, $57,111.01; dividends, $60,000; notes receivable, $4,400; cash, $28,712.16. Total, $5,107,387.83. Liabilities—Capital stock, $4,800,000; gross revenue, $146,350.31; notes payable, $151,624.02; due from divisions, $8,413.44. Gross revenue to October 1, 1883, $147,350.37. Deduct expense account, $57,111.01; dividends (quarterly 1¼ per cent.), $60,000. Total, $117,111.01. Net surplus to October 1, 1883, $30,239.36.

THE ELECTRIC LIGHT.

INCORPORATED.—The Cotton Electric Lighting Company, Canton, Ohio; capital stock $30,000.

FIRES IN PAPER MILLS.—It is said that the use of the incandescent light in the rag room has greatly reduced the danger of fires in paper mills.

BRANCHING OUT.—The Pennsylvania Electric Light Company of Harrisburg, Pa., propose to furnish steam for the heating of residences in that city.

MORE "FIRE RISKS."—An electric-light wire set fire to the framework of a window of the drug store of Lilly, Rogers & Co., Baltimore, last week, and caused an alarm to be sent out by the fire department.

ALABAMA ABREAST.—The Mobile *Register* is receiving the plant for lighting its newly remodeled building throughout with electric light. This is the first newspaper office in the section to adopt this system of illumination.

EVERY MAN HIS OWN ILLUMINATOR.—The London *Telegraph* thinks the time is not far distant when every wayfarer will carry his own ray of electricity about him, inclosed within the compass of a machine not larger than the watch now ticking in his pocket.

A PORTABLE ELECTRIC LIGHT TOWER.—One of the most recent inventions in the matter of electric lighting is a "travelling electric light machine and light tower." It can easily be drawn anywhere by a single horse, and the tower can be raised as high as eight metres.

SUGAR WORKS IN QUEENSLAND.—The Colonial Sugar Co., Homebush, near Mackay, in the Colony of Queensland, Australia, have a mill with a capacity of 5,000 tons per season of 20 weeks. In it is a dynamo machine, so that the operations may be carried on at night by means of the electric light.

ELECTRIC CARRIAGE-LAMPS.—The application of electricity to supplying light for private, as well as public, conveyances bids fair to come into extensive use. In London, last week, several of the carriages which took guests to the Guild-Hall banquet carried electric lights in place of the ordinary lamps.

THE BALL ELECTRIC MANUFACTURING COMPANY, of Reading, Pa., have applied for a charter. The company will manufacture the electric inventions of Messrs. Charles E. and R. E. Ball, of New York, and W. H. Spang, of Reading, which consist of dynamo-electric machines, arc and incandescent electric lights and electric motors.

PHOTOGRAPHING THE LARYNX.—Ingenious applications of the electric light to the exploration of the internal human anatomy continue to be made, among the most recent being some experiments in photographing the larynx and soft palate at the instant of singing. A powerful electric light was thrown into the throat, the subject then sang a note, and the actual position of the vocal ligaments, uvula, etc., was photographed instantaneously.

THE LEWISTON (ME.) COMPANY.—The Lewiston (Me.) Electric Lighting Company has organized, with E. F. Packard as president, Asa Cushman as vice-president, Frank W. Parker as treasurer, and H. N. Wagg as general manager. A lot of land has been selected and contracts awarded for building a central lighting station, to be completed within thirty days, with a capacity of from 200 to 300 lights.

CINCINNATI AROUSED.—A meeting was held on the 16th inst. at Cincinnati, O., of gentlemen interested in the formation of an electric light company for that city. A committee was appointed to solicit subscriptions to the stock of the proposed company. The stock is placed at $200,000, of which 20 cents on the dollar is to be paid in at once. It is expected that sufficient stock will be taken in a week to justify the formal organization of the company.

A CHICAGO PLANT.—The large dry-goods store of Mandel Brothers, in Chicago, is lighted by 700 Edison incandescent burners on the various floors, which is about the number placed by the Edison company in Haverly's Theatre. The light is highly esteemed on account of its cleanliness. Few persons realize the large amount of dirt thrown off by gas-jets, and this makes electric lighting of especial advantage in an establishment where fine goods are exposed.

EFFECTS ON THE EYE.—To the eye, blue or violet tints are more agreeable than yellow, and hence from its composition, as well as from its steadiness and adaptability, the light of the incandescent lamp is especially adapted for the use of the human eye. Distinctness of vision and the perception of color are both increased under the electric light, facts which might be theoretically held to involve an overstrained retina. Such a theory is not, however, borne out by practical experience; it is only where the light employed is unsteady that any ill-effects have been observed.

ENGINES FOR ELECTRIC LIGHTING.—The Cummer Engine Company, of Cleveland, reports the following recent orders for its engines, for electric lighting: The Underground Electric Light Company, Philadelphia, two engines, 350 horse-power; Brush Electric Light Company, of Cleveland, 400 horse-power engine; and engines for the Brush Electric Light Company, Detroit, Mich., and the Brush Electric Light and Power Company, of Toledo, O. The company has a capacity of about four standard-sized engines per week, and expects to increase its manufacturing facilities fully fifty per cent by spring.

NEW ZEALAND EXPERIENCE.—The *West Coast Times* published at a Hokitika office, is now lighted with electric light. When the first lamp was lighted it was considered by those present an entire success; but when six lamps were turned on, the lamps became less steady, and the revolutions of the small engine, which acted as a motive power, decreased considerably, and the light was not steady enough for the printers to read copy by comfortably, as, after every explosion of the gas engine, a slight flicker in the light took place. It is intended to get a larger gas engine, or probably to substitute steam.

THE FULLER LIGHT IN BOSTON.—The managers of the Manufacturers and Mechanics' Institute, Boston, in whose building the American Exposition was recently held, were so pleased with the brilliancy and steadiness of the Fuller lights, and the operations of the apparatus used during the exhibition, that they have now arranged with the Fuller Electrical Co. for the permanent lighting of the building by this system. The company are now setting up the plant required for this purpose. A space of over 60,000 square feet is to be used as a skating rink, and the Music Hall for dancing. The Fuller light is considered to be a very strong additional attraction.

"AURORA'S ROSY LIGHT."—Aurora, Illinois, has just started an incandescent plant of Swan lamps run from a Brush storage battery, and charged on a circuit of six miles of No. 6 wire, getting ten Swan lamps from the batteries for each horse-power exerted at the machine. Large storage plants are now being placed in position in Rock Island, Ill., and La Crosse, Wis., and the Chicago *Times*, after trying gas at one dollar a thousand for the month of November, will compare it with the Brush-Swan system which will be soon ready to run there. The Pullman Palace Car Company is also putting in a large Brush plant, driven by one of M. C. Bullock's straight line engines.

THE ALLEGED "WAR" AT PROVIDENCE, R. I.—With respect to the statement made in various papers that an electric light war is in progress at Providence, R. I., the Boston *Commercial Bulletin* says: This statement does not bear an examination creditably. The American Electric & Illuminating Company, as we learn, have not "just put in a 200 light plant." They have dynamo capacity for running something like 120 lamps in their station at Providence, but have never, as far as we can learn, had a light burning outside of their station. They have not a foot of wire outside their station for the reason that the Providence city government refused the company permission to run their wires in the streets, some weeks ago. They have now petitioned again to be allowed to do business in the city of Providence. The only war in progress would appear to be between the American Electric and Illuminating Co. and the Providence city government.

POETRY OF THE ELECTRIC LIGHT.—A lady, writing to a Western journal of the recent exposition at Louisville, gives the following glowing description of the scene at night: "If you approach it by night long strings of electric lights span the streets, like luminous bells; it seems their twinkle must tinkle into joyous chimes, so fairylike and restless and gay they hang. Besides these Edison lights, all through the park the Brush lights glow like great animated lilies in the air. As the water-lily sways on the stream and is hidden sometimes by the swelling waves, so the current of the air seems to bend and break over this great bed of electric flowers. 'They are gone,' you say. 'No, there they are, firm and brilliant as ever.' But at the next gust they are almost extinguished. Where do they hide in those ether currents, which our eyes cannot penetrate, only to come up again with the graceful rhythms of the lily-bell?"

A SERIOUS ACCIDENT IN BALTIMORE.—In Baltimore, last week, Mr. Thomas Dwyer, foreman of a gang of workmen who were stretching a wire of the Bell Telephone Company across Davis street, corner Monument street, had a narrow escape from death. He had hold of a section of wire which one of the workmen was trying to fasten to the top of a pole. The wire fell from the man's hands across a wire of the Brush Electric Light Company. In an instant Dwyer, who was standing on damp ground, received a powerful electric shock which felled him to the ground. His hands were blistered, and he complained of a terrible burning sensation from his stomach to his throat. Mr. Andrew Speir was passing at the time. He tried to step across the wire, but his foot came in contact with it. The shock threw him violently into the street. A horse attached to a buggy was also tumbled by the shock. Since then large blisters have appeared on Mr. Dwyer's stomach and hips. His right arm is paralyzed and terribly disfigured. His attending physician, however, says it will return to its normal state.

THE LIGHTS ON THE BROOKLYN BRIDGE.—At the present time there are eighty electric lights on the Brooklyn Bridge, furnished by the U. S. Electric Illuminating Company. Mr. Martin, the engineer of the Bridge, made a report to the Trustees on the 12th regarding the lights, in which he gave as his opinion that the lighting of the bridge was not a success. The officers of the United States Company claim, however, that the occasional failure, as mentioned by Mr. Martin, of a few lights, has been due to the excessive vibration of the bridge, caused by the recent

storms and the frequent passage of the cars. The experiment of lighting such a structure by electricity was made, they say, under unique conditions, and has proved, taking the obstacles in the way into consideration, an unquestionable success, although the lighting of the bridge has not, for the above reasons, been all that might have been desired. Steps are now being taken, they say, to neutralize the vibrations that jam the carbons together, and the company have every confidence of giving the bridge trustees satisfaction.

TROUBLES IN NEW HAVEN, CONN.—A dispatch from New Haven, Conn., of the 15th inst. says: "The auction sale of the property of the Connecticut Electric Light Company began to-day, when counsel for the United States Electric Light Company of New York with a sheriff served writs of attachments. Ex-Governor Bigelow, Gen. E. S. Greely and others offered bonds, which were refused, and the sale was stopped. The parties went before Judge Beardsley of the Superior Court to obtain an order for the acceptance of the bonds, and the consideration of the case was deferred until to-morrow. The sale was advertised by the New Haven Electric Light Company, which bought out the plant and good will of the Connecticut company, and assumed its obligations. The United States Company claims that the old company is indebted to it $6,000. An attachment to secure this was previously made followed by an injunction to prevent the sale of any part of the United States system outside of New Haven County. Herrick P. Frost, the largest owner in the new company, protests that the suit is wholly malicious, and says that, while assuming the old company's obligations, his company had provided for them on satisfactory terms." On the 16th the parties interested in the matter of the attachment appeared before Judge Beardsley in the Superior Court and a bond for $8,000 was fixed, with Herrick P. Frost and W. J. Atwater as sureties, to abide the issue of the litigation between the companies.

ANOTHER CHEAP LIGHT.—M. Somzee has made another attempt to produce a cheap and brilliant light by the combination of gas and electricity. The arrangement comprises an ordinary gas flame, fitted with a curved metallic rod passing through the flame, provided with means for preventing overheating under the action of the electric current, which is taken from a secondary battery. It is claimed, in a notice of the arrangement given in the *Journal de l'Eclairage au Gaz*, that under these conditions the illuminating power is considerably augmented in proportion to the additional expense. The light is also said to be white, and much cooler in respect of radiation than a corresponding light from gas alone, the relative proportion of luminous and heat rays being completely changed. What is supposed to render this combination practicable is the fact that the platinum does not require a great intensity of current, and that "one or two small elements will suffice to supply an ordinary light, and make it give four or five times more light at a cost three times less than gas." These are nearly the same data of cost and illuminating power as those to which the public have been made accustomed by electricians. It is a novelty, however, to find gas introduced into the combination in this fashion. According as the intensity of the current is increased or diminished, the flame may be rendered more luminous or hotter, as the case may be, so that the arrangement is "capable of furnishing all gradations, from the brilliant flame to the most calorific radiations." Here, it is evident, is a gas stove and a lighthouse in one, and only needing a reliable secondary battery to be capable of use for either purpose.—*Artisan.*

MISCELLANEOUS NOTES.

THE VIENNA EXHIBITION DEFICIT.—The Electrical Exhibition in Vienna has resulted in a deficit of 30,000 florins, and half the guarantee fund is lost.

"SOLID IMPURITIES."—Dr. Werner Siemens has demonstrated by experiment that intensely hot gases do not emit light, so that light given by heated gas must come from solid impurities.

FROM HEISINGBORG TO ELSINORE.—The Swedish and Danish governments have decided to lay a new submarine cable, of four wires, between Heisingborg and Elsinore, via the island of Hoeen.

ELECTRICITY IN COAL MINING.—A number of blasts were discharged by electricity in the Tunnel Colliery, at Ashland, Pa., on the 3d inst., this being the first successful attempt of the kind in the anthracite region.

THE BUFFALO ELECTRICAL SOCIETY.—At the third regular meeting of this society held on the 16th inst. Mr. Finn read an instructive paper on "Frictional Electricity," illustrated by blackboard drawings and suitable electrical apparatus.

USING THE SWISS WATER POWER.—It is now proposed to use the enormous water power of the Alps to work electric railways in Switzerland. Operations are already begun to connect the towns of St. Moritz and Pontresina by an electric railway, motive power being supplied by mountain streams.

"ELECTRIC SWITCHES."—An exchange says that a feminine devotee of fashion having picked up a railway journal and noticed an article headed "Electric Switches," remarked that they must be gorgeously brilliant, and would save the necessity of wearing diamonds in the hair.—*N. Y. Commercial Advertiser.*

PETROLEUM SOLIDIFIED BY ELECTRICITY.—Among the goods displayed at the American Exhibition, Boston, is petroleum solidified by electricity. It is non-combustible, and in this form is capable of easy and safe transportation to far distant points, and when it arrives at its destination it can be brought back to a liquid state by the application of electricity. It is a German invention.

KRUPP'S ESTABLISHMENT AT ESSEN.—Herr Krupp's great establishment at Essen has its own water and gas works. It contains 25,000 gas-burners in addition to the electric lamps. It has its own chemical laboratory, photographic and lithographic establishments, and printing and binding shops. There are about 50 miles of telegraph wires and 35 telegraph stations belonging to the works.

A STEAMER STRUCK BY LIGHTNING.—As the steamer Columbia was entering the harbor at Panama, she was struck by lightning, but the iron foremast acted as a conductor, and little damage was done. Portions of the iron of the ship became magnetized, so that alterations will have to be made. The compass will not point correctly, and a movement of the wheel will deflect it. All of the magnets on board were demoralized.

OUR ELECTRICAL EXHIBITION.—To meet the expenses of the international electrical exhibition to be held in Philadelphia next fall fully $50,000 will be needed, and $30,000 has already been subscribed. The block comprising from Thirty-second to Thirty-third street and from Lancaster avenue to Foster street has been secured. The site was partly tendered by the Pennsylvania Railroad Company, and is within a few squares of the Market street bridge, which will make it accessible from all quarters by both the street and steam cars.

THE ELECTRIC, MANUFACTURING AND MISCELLANEOUS STOCK EXCHANGE.—The following gentlemen have been appointed a regulation committee of the Electric, Manufacturing and Miscellaneous Stock Exchange of this city, which will begin business at Nassau and Pine streets on December 3: Charles Heygendorf, chairman; Niles P. Lassen, William Laurent Bailey, Hugh Smith and Albert H. Joslyn. It has been provided that members of the New York Stock Exchange may, upon payment of a registry fee, have access to the floor of this exchange.

ELECTRO-THERAPEUTICS IN LONDON.—Dr. de Watteville has been appointed physician, at St. Mary's Hospital, London, to the electro-therapeutic department. In other words, the most progressive and successful of the smaller London hospitals has, after a long struggle, elevated electricity as a medical agent into the sphere of accepted and acknowledged science. The experiments of Dr. de Watteville with electricity were for a long time derided by the medical faculty, but now he is accepted as one of the highest authorities in all nervous diseases. He has been ten years in accomplishing this result.

A NEW UNDERGROUND COMPANY IN CHICAGO.—A license to incorporate has been issued to the Union Electric Underground Company, of Chicago. Its authorized capital is $3,000,000, and the commissioners are Henry B. Cobb, Graeme Stewart and Sam B. Cobb. The company intends to manufacture apparatus for perfecting wires underground, the invention being that of Mr. H. B. Cobb, but what it consists of the parties are unwilling to tell at present. One mile of wire, however, is soon to be put underground in the Base-Ball Park for the purpose of showing what the system is capable of. Several Chicago capitalists are said to be interested in the company.

ELECTRICITY AS AN ENGRAVER.—A gentleman of Washington, D. C., Herman Lauten, has, we hear, invented or perfected instruments which, with the use of electricity, do the work of instantaneous engraving. Fac-similes of steel engravings are said to have been made which cannot be distinguished from the originals, and the instantaneous method would be peculiarly adapted to large illustrations, colored plates and the like. The difference between this process and photography is, that in this electricity does the work which the sun does in the other. No doubt this process will attract general attention, as a company has been started in Washington for the purpose of developing electrical engraving.

CURRENTS PRODUCED BY NITRATES.—M. Brard has communicated some investigations to the French Academy, which give the following results: 1. On plunging a red-hot carbon into a bath of melted nitrate an energetic current flows from the bath into the exterior circuit. 2. The melted nitrates become very fluid and, like greasy bodies, lubricate the heated bodies with which they come in contact. 3. In order to obtain a current it is not necessary to plunge the carbon into the nitrate bath, but it suffices to place a metal capsule containing some grains of the melted nitrate upon the burning carbons. M. Brard is continuing his experiments with a view to apply them practically in the production of light and heat.—*Les Mondes.*

NOT PRODUCED BY EVAPORATION.—Dr. L. J. Blake, of London, has been investigating the statements of Pouillet and others to the effect that electricity is produced by the simple evaporation of a liquid. He worked with sea-water, sulphate of copper solution, chloride of sodium solution, etc., but in every case the results went to show that electricity is not produced in this way, and that some other means must be found of explaining the production of atmospheric electricity. Dr. Blake also negatives the hypothesis of Franklin and others to the effect that electricity is conveyed by still evaporation from an electrified liquid. The experiments were conducted with a quadrant electro-meter of M. Voss, Berlin.

THE T. M. B. A. MEETING.—The fifteenth annual meeting of the Telegrapher's Mutual Benefit Association was held on the 21st inst. at the Continental Hotel, Philadelphia. The proceedings of the meeting were agreeably opened by a banquet at the hotel. After that Mr. Clarence Cary, attorney of the Western Union Co., and President of the Association, called the gathering to order. Mr. Cary resigned his office, and Mr. A. R. Brewer was unanimously elected in his place. Mr. W. H. Young was elected Vice-President; Mr. S. M. Taylor, Treasurer; and Mr. C. B. Bruch, Secretary. A large amount of business was attended to, and a resolution was adopted and ordered to be cabled to Europe expressing the sympathy of the Association with the family of the late Sir Charles William Siemens in their great bereavement.

ELECTRIC MUSIC.—An experiment by Prof. H. S. Carhart, says the *Mining and Scientific Press*, is as follows: A disc of sheet iron was pierced with two circles of quarter-inch holes concentric with the disc, the number of holes in the two circles being thirty-two and sixty-four respectively. On one side of the disc was placed a horse-shoe magnet, with its poles very near the rows of holes; on the other side were arranged two corresponding induction bobbins. The circuit was completed through a telephone and either bobbin at pleasure. Upon rotating the disc rapidly, a clear musical sound was produced in the telephone, the pitch rising with the rapidity of rotation. Moreover, the bobbin opposite the circle of sixty-four holes gave the octavo above the other, and each gave a note of the same pitch as was produced by blowing a stream of air through the corresponding holes.

IN PLACE OF GUTTA-PERCHA.—An exchange says that a perfect substitute for gutta-percha, which is claimed to be far cheaper than that useful material, has been patented by a German chemist. The process of manufacture is briefly described as follows: Powdered gum copal and sulphur are mixed with about double their bulk of oil of turpentine or petroleum, and the mixture well heated and thoroughly stirred. After being allowed to cool to a certain temperature, casein in a weak solution of ammonia is added to the mass. Once more it is heated to its former temperature, and is then boiled in a solution of nutgall or catechu. After some hours' boiling, the product is cooled, washed in cold water, kneaded in hot water, rolled out, and finally dried. If, as is claimed, the manufactured article cannot be detected from the real gutta-percha, and will answer the same purposes, it will have wide application, if only for the insulation of electric wires and cables, and for the making of golf-balls.

STOCK QUOTATIONS.—Telegraph, telephone and electric light stocks were quoted on Thursday of last week and Thursday of this week as follows:

	Nov. 15.	Nov. 22.
TELEPHONE.		
American Bell Telephone	204	190
Union Telephone	80	.. .
Bay State Telephone	97	....
Tropical Telephone	1¾	2⅛
Mexican Telephone Co.	2 5/16	3¼
National Bell Telephone of Maine	65	....
New York and Pennsylvania	88	....
Boston & Northern Telephone	100	....
People's Telephone	7	7
Suburban	100	....
Erie Telephone	46	46
New York and New Jersey	94	85
Continental	10	....
Dolbear	9½	....
Missouri & Kansas	95	....
Molecular	10	....
Overland	4	....
Shaw	10	....
Southern New England	180	....
Southern Bell	105	....
Hudson River Telephone	100	105
Globe Telephone	20	30
New England	....	70
TELEGRAPH.		
American Cable	61¾	62⅛
Western Union Telegraph	79⅛	79⅝
Bankers and Merchants' Tel.	138⅛	138⅛
Mutual Union Telegraph	17¾	17¾
American District Telegraph	16	16
Postal Telegraph Bonds with stock	48	....
ELECTRIC LIGHT.		
Brush Electric Light	85	....
Edison Electric Illuminating	71	....
Edison Electric Light	145	150
Edison Isolated	100	....
U. S. Electric Lighting	117	117
United Globe Electric Light	85	85
Fuller Electrical	20	....
Swan Electric Light Co.	....	110
MISCELLANEOUS.		
Commercial Telegram	95	....
Electric Railway of U. S.	60	....

THE PORTRUSH ELECTRIC RAILROAD.—It is stated that the proprietors of the Portrush, Ireland, electric tramway will shortly be able to dispense with the wire along their line, as they hope to make the electric rail serve the double purpose. Experiments—so far successful—are being made by which the rail may serve also for a telephonic conductor. On this road the electricity, generated at a waterfall on the River Bush, and conveyed to the end of the line by an underground cable, is carried along through a conducting rail, which is supported on insulators at some distance above the ground. An arm with a brush or pad at one end of it stretches out from the tram and keeps contact with this conductor. But the day the lord lieutenant came to "inaugurate" the line it was suddenly found that there was a serious hitch. The engine declined to draw the car. The machinery was in perfect order; the connection with the conductor was all right, and yet there was no motion. Horror filled the souls of the public-spirited promoters of the first electric line in the United Kingdom. It was discovered, happily, before much time had been lost, that somebody had rendered progress impossible by the simple expedient of driving a piece of iron from the electric rail into the bank at the side; so that the current was being absorbed into the earth as fast as it was transmitted from the Bush. The iron being removed, the vice-regal party made a successful trip.

ELECTRICAL INSTRUCTION IN GERMANY.—While we are insisting here upon the great importance of electrical training for the students in colleges and universities, in Germany the same need is felt. Prof. Braun, at Carlsruhe, lately outlined a system of "electro-technical instruction" to be furnished as follows: A year and a half of mathematics, a good insight into analytical mechanics, practice in solving the simpler problems of higher mathematics, exercise in the use of the so-called principles of mechanics; in chemistry a firmly-grounded knowledge of inorganic chemistry, such as can only be obtained by laboratory practice; in physics, a clear and full understanding of the whole of experimental physics; a clear knowledge of electricity based upon mathematical principles, and especially in galvanic electricity; and experience in the application of theory to special cases. To this must be added practical work in the laboratory, so as to become familiar with the principal methods of physical and electrical measurements in general use. It would also be desirable for him to carry out successfully some scientific physical research, especially in galvanism. Of course a knowledge of machine building must be added to these. As some readers of THE ELECTRICAL WORLD are aware, Harvard, Yale and other seats of learning are now devoting to electricity a regular portion of the time of students; and from this beginning we hope for great results.

BUSINESS NOTICES.

E. W. WAGNER.—This house, of 36 John street, is well known to those in need of electrical supplies and electro-medical books. Mr. Wagner has out an illustrated and descriptive catalogue and price list. It includes the "Gaiffe Battery," the 'Faradic Family Medical Battery," the "Physician and Family Battery," the "Constant Curren Battery," the "Combination Battery," magneto-electric machines, magnets, dental helix, electrolytic nee lles, electrodes, and the Grenet battery. Prices are named with each article. The pamphlet concludes with a list of useful electro-medical works.

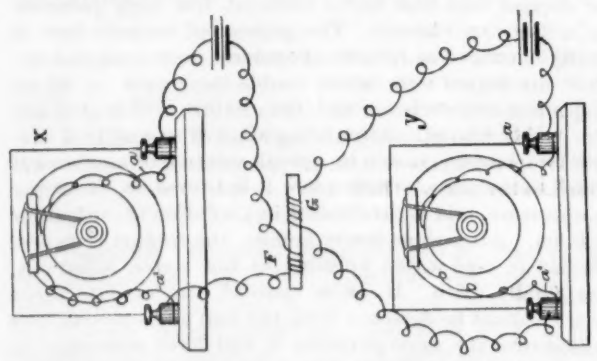
KEUFFEL & ESSER'S CATALOGUE.—We have received from the above firm, of 127 Fulton st., a copy of their new illustrated catalogue. It has just been issued and comprises several novelties of value to the profession and trade. The firm have the highest repute for their drawing materials, magnetic compasses, barometers, hand levels, paints, brushes, papers, and all the varied instruments required by civil, railroad and mining engineers. Many of these articles are of their own manufacture, such as surveying instruments, rods, chains, compasses, drawing boards, tables, scales, rules, T squares, triangles, curves, tapes, etc. The catalogue is an elegant publication, of nearly 250 pages, bound in a stiff cover, and profusely illustrated. The present edition is the seventeenth.

THE "ELECTRICAL WORLD'S"
ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

ALL THE PATENTS MENTIONED BELOW ARE DATED NOV. 13, 1883.

Telephone; A. E. Dolbear, of Somerville, assignor by mesne assignment to the Dolbear Electric Telephone Company, of New Jersey.....288, 215

This invention consists in the combination with two coils *F G*



on the same core, of two transmitters *X Y*, and two batteries, one in circuit with each coil.

Adjustable telephone holder and automatic circuit breaker; W. A. Eckert, J. A. Seely and E. O. Eckert, of Cincinnati, O.....288,320

The telephone holder consists of an adjustable arm hinged to a base plate and held at any desired height by a pawl on the arm, on a sector-ratchet on the base plate. A switch for completing and breaking the circuit is connected with this arm.

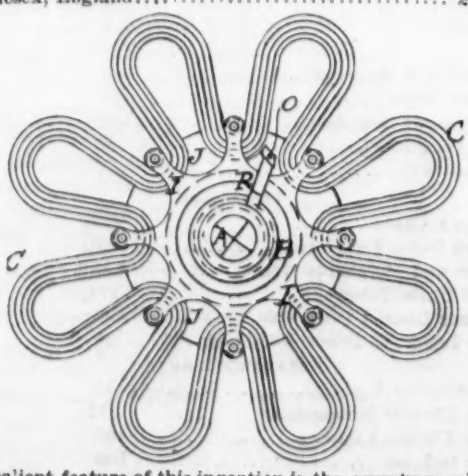
Contact for electric lamps; Henry Edmunds, Jr., of New York, assignor to Thos. J. Montgomery, of Boston, Mass.....288,218

The base of the lamp carries two contact springs connected with the ends of the lamp conductors, and capable of contacting with two points at the ends of the main conductors. The base of the lamp is secured in its socket by a bayonet lock.

Conduit for electric wires; B. A. Deyer, of New York City.....288,555

This conduit is designed to fully protect the wires and at the same time afford convenient access to the interior for the purpose of laying or repairing the conductors. The conduit is designed to be placed in the street with its vertical side against the curb-stone. It is provided with a heavy sectional cover carefully fitted to its upper edges, and it also has an interior cover which condenses the moisture in the conduit and delivers it to gutters, which conduct it away.

Dynamo-electric machine; S. J. de Ferranti, of Richmond Gardens, Shepherd's Bush, and Alfred Thompson, of Guildford Place, Russell Square, County of Middlesex, England.....288,316



The salient feature of this invention is the armature, which is so clearly shown in the engraving as to require little description to make its construction clear. It consists of an armature coil or conducting bar of zigzag shape, mounted on a disc and arranged to be rotated in the magnetic field. The field magnet of this dynamo has as many sections or magnets on each side of the armature as there are radial parts of the zigzag conductor. This machine yields alternating currents.

Electrical signals; Edward Dummer, of Boston, Mass..288,556

This signal is operated by the vibration of the ground, and is applicable to railways and common roads. Its construction resembles that of the telephone.

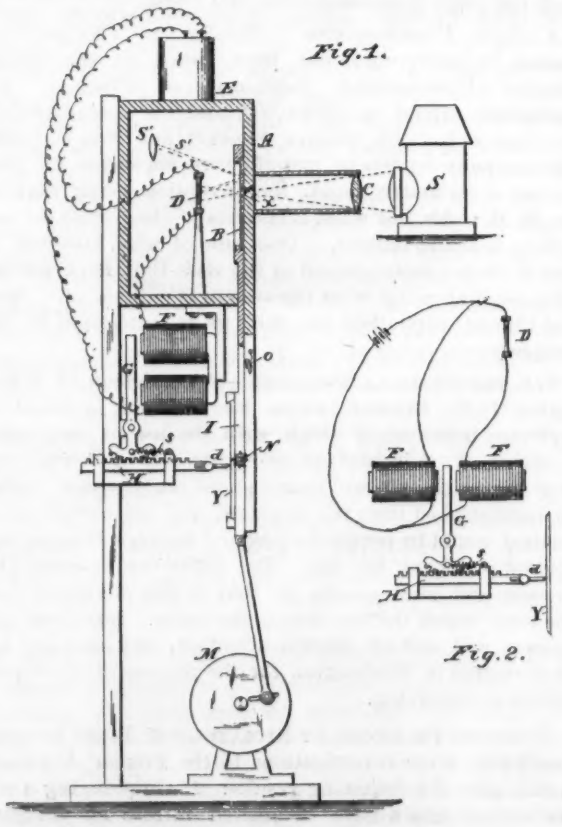
Electrical train-stopping and signaling apparatus for landslides; W. P. Phelps, of Philadelphia, Pa., assignor to the Railroad Safety Lock and Signal Company, New Jersey.....288,480

This is a wire cloth guard supported above the track and connected with an electric circuit provided with signaling apparatus. Anything falling upon or against the guard, breaks or closes the electric circuit and gives the alarm.

Electric signal box; J. C. Wilson, of Boston, and M. G. Davis, of West Somerville, Mass.; said Davis assignor to said Wilson.....288,536

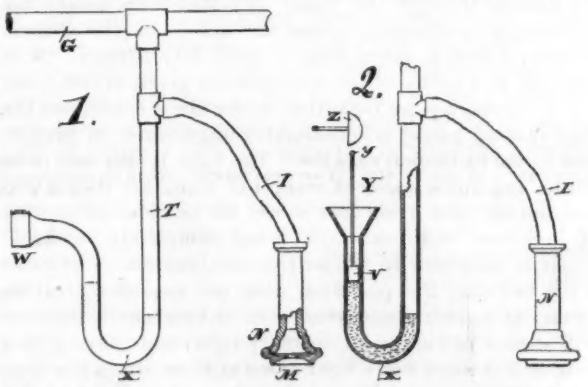
This box is set off by the "starting key," which may be inserted and turned to wind the actuating spring and thus operate the signaling mechanism; but the key cannot be removed except by some person authorized to unlock the signal box.

Method and apparatus for cutting and shaping objects; Forée Bain, of Chicago, Ill., assignor to the Bain Electric Company, of same place.....288,395



In this apparatus the graver or cutting tool is controlled by means of light or heat rays passing through a pattern. The pattern *B*, which may be a photographic negative or positive, is placed in the path of rays emanating from the lamp *S'* and focused upon the selinium cell *D*, which latter is in circuit with the battery *E* and magnet *F*. An arm *H* carries a graver *d* and is connected with the armature *G* of the magnet *F*. The plate *v* to be engraved moves beneath the graver *d* in unison with the pattern plate *B*, which is reciprocated longitudinally, and is moved laterally by a step-by-step movement, so that all parts of the pattern plate are traversed by the rays, and all of the parts of the plate *I* are carried beneath the graver. As the strength of the current is varied in accordance with the variations of the rays received upon the selinium-cell, there will be a corresponding variation in the strength of the electro-magnet, and the graver will be moved in and out accordingly, producing in relief on the plate *I* the design which exists only in the transparent and more or less opaque parts of the negative.

Apparatus for telephonic communication; J. H. Rogers, of Washington, D. C., assignor by mesne assignment to the American Electro Gas Telephone Company, of New Jersey.....288,336



This invention, although not an electrical one, is related to the telephone, and may properly be described in these columns. The apparatus is designed chiefly for domestic purposes, to be used instead of speaking tubes, electric bells, annunciators, etc. The gas pipes of a building are used as means of communicating speech and transmitting signals. Transmitters and receivers having vibratory diaphragms are connected with the gas pipes by means of flexible tubes. The diaphragms are in contact with the gas, so that the vibration of one of the diaphragms will be communicated to the others through the medium of the gas. Fig. 2 shows a device for signaling. It consists of an inverted siphon or trap communication at an end with the gas pipe and having in the other end a float, carrying a bell hammer which strikes the bell when an impulse is imparted to the float through the medium of the liquid in the trap.

Subterranean line of electric wires; H. B. Cobb, of Wilmington, Del.....288,211

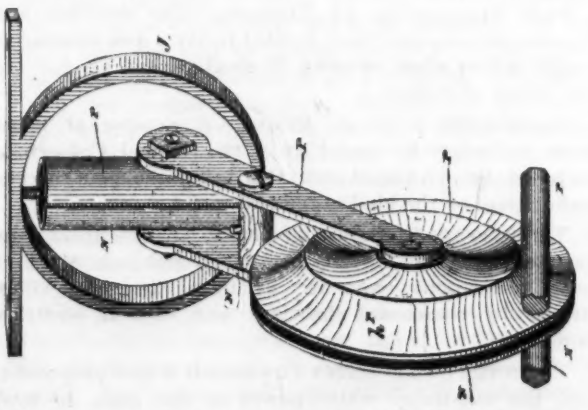
A conduit enclosing one or more metallic tubes is placed under ground, and the conduit and tubes are in electrical contact.

Each metal tube contains a tube of insulating material in which are placed the conductors. It is claimed that in consequence of the immediate contact of the conduit with the earth, that induction is obviated.

Telephonic apparatus; J. H. Kinsman, of Rye, N. Y... 288,449

This apparatus is designed for use upon a line in which there are many instruments. It admits of calling any person upon the line without disturbing the others.

Electric railway and locomotive; W. M. Thomas, of Cincinnati, O., assignor of one-half to S. W. Skinner of same place.....288,513



This engine possesses many novel and interesting features, one of which is the device for taking the current from this conductor, which the inventor calls the "duplex runner." This runner is really a caster made in two lateral halves separated from each other by electric insulation. The sides of the caster wheel are concaved and the wheel runs between the two conductors. The caster adapts itself perfectly to the inequalities of the conductor and maintains a frictional contact which always insures an electrical connection.

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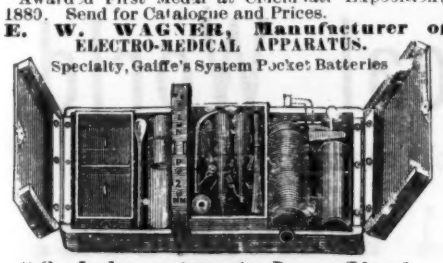

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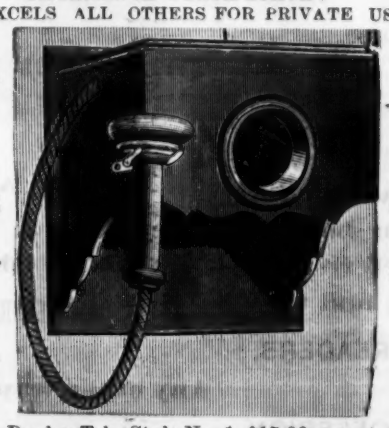

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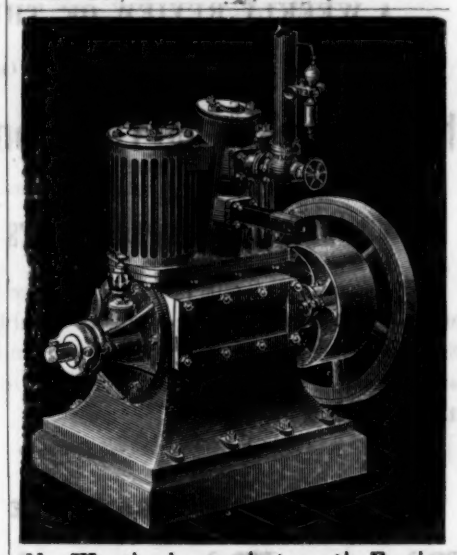

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Phila. & Reading Coal & Iron Co., Pottsville, Pa	80	"
Phila. & Reading Coal & Iron Co., Pottsville, Pa.	65	"
Phila. & Reading Coal & Iron Co., Reading, Pa	50	"
Philadelphia & Reading R. R. Co., Pottstown, Pa	50	"
Arnoux Electric Light Co., Cleveland, O.	65	"
" " " " " "	65	"
Brush Swan Electric Light Co., Cheyenne, Wy.	65	"
Pacific Rolling Mill Co., San Francisco, Cal.	65	"
C. R. Mabley, Electric Lighting, Detroit, Mich	65	"
C. R. Mabley, Electric Lighting, Detroit, Mich	8	"
N. Y. & Brooklyn Electric Light Co., New York	50	"
N. Y. & Brooklyn Electric Light Co., New York	50	"
N. Y. & Brooklyn Electric Light Co., New York	50	"
N. Y. & Brooklyn Electric Light Co., New York	50	"
Butte Electric Light Co., Butte, Mont.	50	"
" " " " " "	50	"
Brush Electric Light & Power Co., Savannah, Ga.	50	"
Brush Electric Light & Power Co., Savannah, Ga.	50	"
Brush Electric Light Co., Buffalo, N. Y.	50	"
Decatur Electric Light Co., Decatur, Ill.	50	"
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McKinney Mfg. Co., Machine Shop, Pittsburgh, Pa	50	"
John Leggett, Laundry, Troy, N. Y.	40	"
Massey Mfg. Co., Machine Shop, Toronto, Can	40	"
Geo. E. Nissen & Co., Wagon Factory, Salem, N. C.	40	"
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Sharna & Davidson, Planing Mill, Portland, Or.	30	"
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Baldwin Locomotive Works, Philadelphia, Pa	12	"
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Thos. H. McCollin, Philadelphia, Pa.	8	"
Battle House, Electric Lighting, Mobile, Ala	8	"
Newport Oil Co., Electric Lighting, Newport, Ark.	8	"
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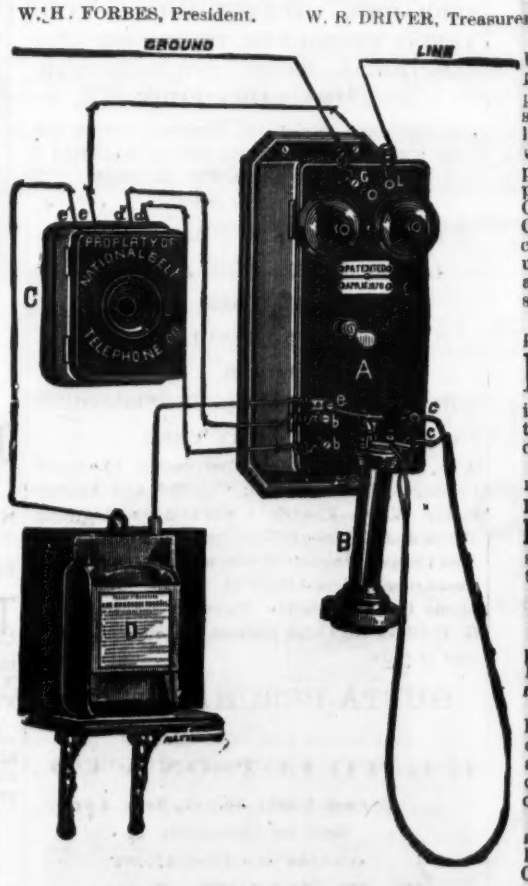

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CHAPTER V.—LAWS OF CURRENTS.—Electromotive Force—Strength of Current—Resistance—Ohm's Law—Unit Strength of Current—Unit Quantity of Current—Unit of Resistance—Laws of Resistance—Capacity—Unit of Capacity—Practical Units—Practical Units of Potential; of Resistance; of Quantity; of Capacity—Simple Circuits—Grouping of Cells—Long and Short Coil Instruments—Branch or Shunt Circuits—Development of Heat by Currents—Joule's Equivalent—Electrolysis—Ions—Laws of Electrolysis—Electrical Writing—Electrotyping—Electroplating.

CHAPTER VI.—SECONDARY OR STORAGE BATTERIES.—Laws Governing Electric Storage of Energy—Grove's Gas Battery—Planté's Secondary Battery—Faure's Battery—Batteries of Sellon, Swan, Brush, Kabath, Maloney and Koyl, Eaton, Starr, Finney, Haid, Edison, Keith—Electromotive Force and Chemical Force.

CHAPTER VII.—THERMO-ELECTRIC BATTERIES.—General Description—Prospects of Thermo-Electricity—Batteries of Brard, Jablochkoff, Higgs, Randal, Patterson, Wallace and Davies.

CHAPTER VIII.—ELECTRO-MAGNETISM.—Magnetic Nature of Electric Currents—Electro-Magnets—Positive and Negative Directions of Lines of Force—Ampère's Theory of Magnetism—Action of Currents on Magnetic Needles—Deflection of Conductors by Magnet-Poles—Magnetic Actions of Currents on each other—Forms and Proportions of Electro-Magnets—Electric Bells.

CHAPTER IX.—INDUCTION-CURRENTS.—General Description of Phenomena—Direction of Induced Currents—Unit Electromotive Force of Induced Currents—Induction of Currents by Currents—Induction-Coils—Extra Currents; Self-Induction—Ruhmkorff's Coil.

CHAPTER X.—ELECTRICAL MEASUREMENTS.—Galvanometers—The Sine Galvanometer—The Tangent Galvanometer—The Differential Galvanometer—Sir William Thomson's Mirror Galvanometer and Marine Galvanometer—The Ballistic Galvanometer—Ammeters—The Deprez Ammeter—Ayrton and Perry's Ammeter and Voltmeter—Ayrton and Perry's Spring Ammeter and Voltmeter—Ayrton and Perry's Wheel and Pinion Ammeter and Voltmeter—Voltameters—Zinc Voltameters—Measurement of Resistance—Methods with Sine and Tangent Galvanometers—Differential Method—Wheatstone's Bridge—Rheostats and Resistance-Coils—Battery Measurements—Measurement of Internal Resistance and Electromotive Force—Measurement of Capacity.

CHAPTER XI.—TELEGRAPHY.—General Description—The Sounder—The Relay—The Polarized Relay—The Key—The Register—Multiplex Telegraphy—Duplex Systems—Quadruplex Systems—Harmonic Telegraphy—Speed of Signaling—Retardation; Electro-static Charge—Retardation on Land Lines—Automatic Telegraphy—General Description—The Leggo System—Autographic Telegraphy.

CHAPTER XII.—THE TELEPHONE.—Reiss' Musical Telephone—Bells Theories—Undulatory Currents—Bell's Telephone—Edison's Transmitter—Edison's Motograph Receiver—Induction Transmitters—The Microphone—Induced Effects—Theories of the Microphone—Limited Telephonic Transmission—Submarine and Underground Telephone Lines.

CHAPTER XIII.—THE ELECTRIC LIGHT.—Arc Lights—Regulators—Arc Lights in Series—Differential Lamps—Clutch Lamps—Clock-work Lamps—Jablochkoff Candles—Incandescence-arc Lamps—The Soleil Lamp—Incandescence Lamps—Starr's Lamp—Edison's, Maxim's, Swan's, and Lane-Fox's Lamps.

CHAPTER XIV.—ELECTRIC MACHINES.—General Principles—Different Classes of Machines—Commutators—Alternate-Current Machines—Continuous-Current Machines—Edison's Machine—Weston's Machine—Gramme's Machine—The Brush Machine—Excitation of Field-Magnets—Different Methods of Excitation—"Characteristic" Curves of Dynamos.

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CHAPTER XVI.—ELECTRIC DISTRIBUTION OF POWER.—General Principles—Electrical Work—Unit of Electrical Work—Electrical Horse-Power—Table of C. G. S. and English Units—Transmission of Power—Radiation of Heat by Conductors—Different Systems of Electric Distribution—Series System—Multiple-Arc System—Multiple-Series and Series-Multiple Systems—Accumulator System—Motor-Dynamo System—Induction System—Advantages and Disadvantages of each System—Maintenance of Constant E. M. F.—Size of Conductors; Sir William Thomson's Rule—Generative Efficiency of Machines; Silvanus Thompson's Rules—Lead of Brushes—Electrical Efficiency of Machines; Formulas therefor—Efficiency and Maximum Power of Motors; Formulas therefor—Arrangement of Accumulators.

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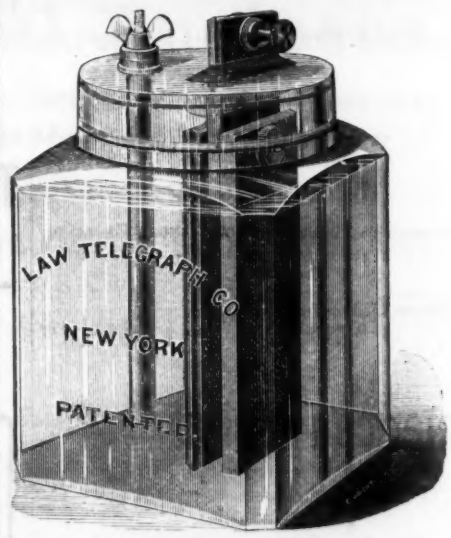

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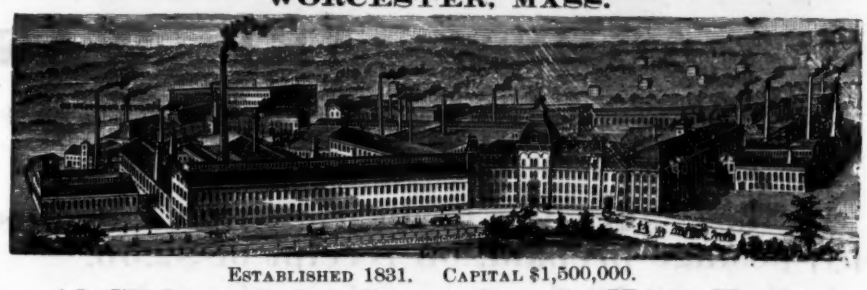

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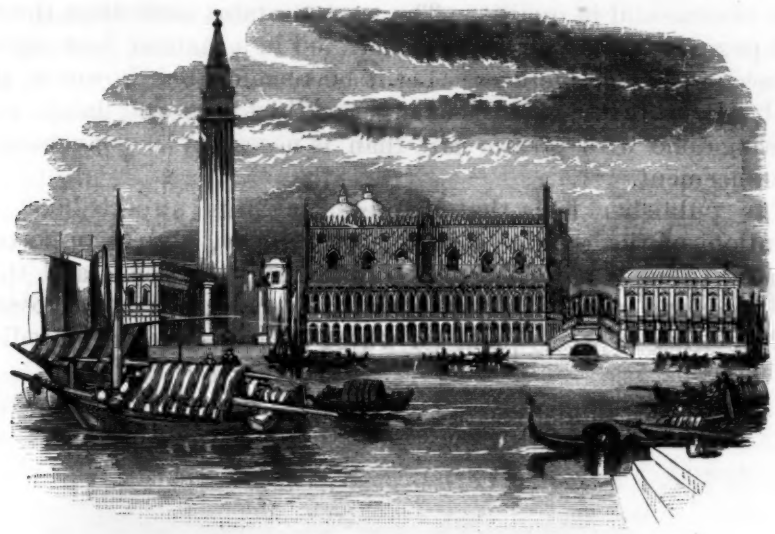

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"We are selfish men;
Oh! raise us up, return to us again;
And give us manners, virtue, freedom, power.
Thy soul was like a star, and dwelt apart;
Thou hadst a voice whose sound was like the sea:
Pure as the naked heavens, majestic, free.
So didst thou travel on life's common way,
In cheerful godliness; and yet thy heart
The lowliest duties on herself did lay."

These words placed one more disciple at the feet of a prophet who perceived and felt above all others the deep harmonies of Nature—their power to soothe and heal, to chasten and subdue the passions, to refine and to endow with an abiding happiness. From that time to now every day spent without some companionship with Wordsworth has seemed to be an imperfect one.

No poet is more tenaciously admired than Wordsworth, and no poet has been the subject of more flippant criticism. The distinction between "is" and "has been" in the preceding sentence is one well considered. Wordsworth's poetry has survived the attacks of small wits and is ranked among the best which gives an unmatched distinction to English literature. The critic can now write Shakespeare, Milton and Wordsworth as the greatest names in English verse, and his judgment is not the subject of a sneer. Fifty years ago this estimate, which is extensively and increasingly accepted, would have been received with surprise, if not with contempt. Wordsworth's poetry has proved like gold tried in the furnace.

Admitted that Wordsworth, like the most of people, had a crotchet. His earlier poems were distinguished by an affectation of

"Happier far
Could they have lived as do the little birds
That peck along the hedges, or the kite
That makes his dwelling on the mountain rocks."

simplicity as to subject and style, which his ingenious defense thereof failed to justify. But his genius survived an inconsiderable weakness of its immaturity. The English language has rarely reached such copiousness and majesty of diction as in many passages cullable from the works of the Lake poet. For example:

"Within the soul a faculty abides,
That with interpositions, which would hide
And darken, so can deal, that they become
Contingencies of pomp, and serve to exalt
Her native brightness. As the ample moon,
In the deep stillness of a summer eve
Rising behind a thick and lofty grove,
Beams like an unconsuming fire of light
In the green trees; and, kindling on all sides
Their leafy umbrage, turns the dusky veil
Into a substance glorious as her own,
Yea, with her own incorporated, by power
Capacious and serene—like power abides
In man's celestial spirit; Virtue thus
Sets forth and magnifies herself; thus feeds
A calm, a beautiful and silent fire
From the encumbrances of mortal life,
From error, disappointment—nay, from guilt;
And sometimes, so relenting Justice wills,
From palpable oppressions of despair."

The enthusiasm of a steady admirer is perhaps excusable, even when it leads him to deprecate the omission from any edition of Wordsworth's works of the poems which so wonderfully exercised the pleasantry of certain critics upon their first appearance. There must be more than their simplicity to account for the wonderful popularity of "We Are Seven," "Lucy Gray," "The Pet Lamb," and other early pieces printed and beautifully illustrated in the edition suggesting these remarks. The truth is that their deep undercurrent of thought and feeling influences the popular judgment beyond the carpings of verbal critics with their musty precedents. While "Tintern Abbey" and the "Ode on Immortality" are, of course, infinitely out of the reach of petty criticism, the detractors of Wordsworth should remember that the early poems survive and are published with the unquestionably immortal efforts of his muse. Dear to the universal heart is the doctrine of the survival of the spirits of the dead in another condition of being, and of their

sweet kinship with the dear ones left behind, but destined to rejoin them in a better life:

"'But they are dead: those two are dead,
Their spirits are in heaven!'
'Twas throwing words away: for still
The little maid would have her will,
And said: 'Nay, we are seven.'"

Moreover, the choice spirits of all ages have been touched with the

"A garden plot the mountain air perfumes,
'Mid the dark pines a little orchard blooms."

same sympathy expressed with simple beauty in "The Pet Lamb." Burns saw in the field mouse "a poor earthborn companion and fel-

"We are seven,'

low-mortal." These remarks could be extended further. The claim is not made that Wordsworth never flags or fails, but all that he said has a feeling and a purpose, is grounded on a conviction or a sublime perception which the least dignified expression cannot injure or impair. Moreover, peculiarities which those who do not know and love the poet cannot tolerate are an interest and a charm to those who companionate with him day by day.

Wordsworth freely confides with his readers. He lays bare his innermost thoughts, his deepest feelings. His poems are in this sense egotistical; but their author was not destitute of dramatic ability, as some critics say. The skeptic in the "Excursion," for example, leaves on the writer's mind an impression that his personality is entirely distinct from that of Wordsworth at any period of his life. There is not, to his knowledge, any proof against the presumption that the skeptic is as real a creation as Shakespeare's Hamlet.

A word should be said in commendation of Wordsworth's style. He is eminently scholarly and precise in his employment of language. For this reason, if for no better one—but a better would soon follow—our young people should be encouraged to study his works among those of other masters of the language. In these busy times, a correct use of English is most desirable. Comparatively few persons attain this capability, and the mention of one aid thereto may be of service.

This brief review, necessarily incomplete, will, perhaps, answer a useful service as introducing a superb volume which the publisher has produced in time for the holiday trade of the present year. It contains poems of William Wordsworth, edited with an introduction by Richard Henry Stoddard. This feature of the edition gives it a special interest to the numerous admirers of Mr. Stoddard, himself no inconsiderable poet, and whose remarks will be found of great value as a piece of criticism. They are discriminating, just and learned, and give an American character to the book which is pleasing and satisfactory to those who desire the development of national scholarship and literary taste, and give them encouragement.

The paper and letter press are of the best, and binding most tastefully ornamental in quality. The work contains more than three hundred pages octavo, generously illustrated in a manner best shown by the accompanying pictures. Let it be remembered, however, that in the book itself the paper is of superior thickness and finish, and the printing done with greater care than is necessary or convenient in an announcement.

The publisher feels that in presenting this superb book to the attention of the public—a book, by the way, always opportune as a gift, a valuable accession to the library and the home, and the pure instructor and solace of many hours to every appreciative possessor—he is making an experiment for which he can confidently predict success. The poet, the editor and the publisher has each done his part; and now, gentle reader, it only remains for you to do yours.

"This sea that bares her bosom to the moon."

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LISTEN, my children, and you shall hear
Of the midnight ride of Paul Revere.

having a live interest in this unique period of history. But the affections and the emotions are the same now as ever in the past, and in the great future to come. They are excited by means which may differ from those in times that are gone, and in compiling verse for popular reading, this is wisely borne in mind. Still, in the collection herewith announced, are given many beautiful verses which awaken thought of other times and different modes of life, and quicken the sensibilities to a wide range of sympathy.

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The publisher can find space for the mention of but a few opinions of the press as to the eligibility of "Christmas Evergreens" for a gift book, the parlor and the drawing-room table.

The New York *Evening Post* says it is "a very pretty compilation;" the Boston *Transcript*, "the book is well illustrated and handsomely printed; the New York *Tribune*, after a flattering description adds, it "furnishes an acceptable gift of a moderate price." The Washington *Republican*, Providence *Press*, *Publishers' Weekly* and other prominent journals give a similar account of the work.

TELEGRAPHIC TALES AND TELEGRAPHIC HISTORY. A Popular Account of the Electric Telegraph; Its Uses, Extent and Outgrowths. By W. J. Johnston. 254 pages. Cloth. Tinted Paper. Price $1.

The success of this book has been a marvel, the first large edition having been sold out in a few months. It was written for the public, who find in it very instructive matters presented without technicalities, and affording recreative reading which leaves valuable results. It is fascinating as a story, yet every possessor has in it a full and complete history of the development of the most wonderful achievement of modern progress—namely, the subjugation of the lightning and its service to the needs of man. A chapter on pre-electric telegraphs is followed by an account of the invention and of its introduction into this country. Then follow a talk about operators and messengers and a chapter on the use of the telegraph in war, in which due prominence is given to the American civil war. Cable telegraphs and the Atlantic cable—a valuable contribution to the history of invention—is succeeded by humorous stories and "bulls." Next the freaks of the lightning find places, succeeded pleasantly by an account of abuses wrought by the employment of lightning as a messenger. Weather reports, railway telegraphy, and new and curious applications of the electric current, with a whole chapter on Electricity and Life, and another copious one on Outgrowths of the Telegraph, complete an outline survey of the work, which includes within a moderate compass all that the general reader requires to know about the subject treated.

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Other pr ominent newspapers have given considerable space to quotations from this volume, which the publisher confidently recomme nds as a very salable holiday book, and one in steady demand throughout the year. Young people are invariably pleased with it.

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"Wired Love," remarks the Chicago *Inter-Ocean*, "is a good book to make you forget business and cares, and leaves pleasant memories behind it." The Boston *Transcript* advises every one who wishes to read a bright, original book, and desires a good laugh, to buy "Wired Love." The New York *Mail* commends it for its "cleverness and humor." The Boston *Herald* adds that the "book is written in an easy, off-hand style, is pervaded with great humor, and its sentimental portions contain some suggestions of wisdom that are expressed with great force, beauty and originality."

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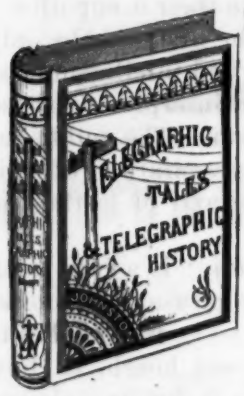

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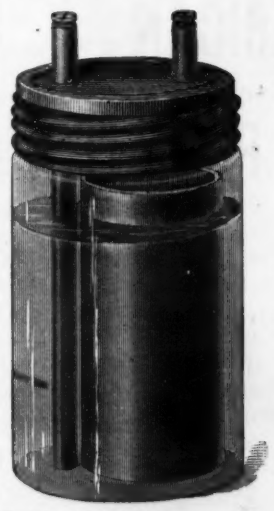

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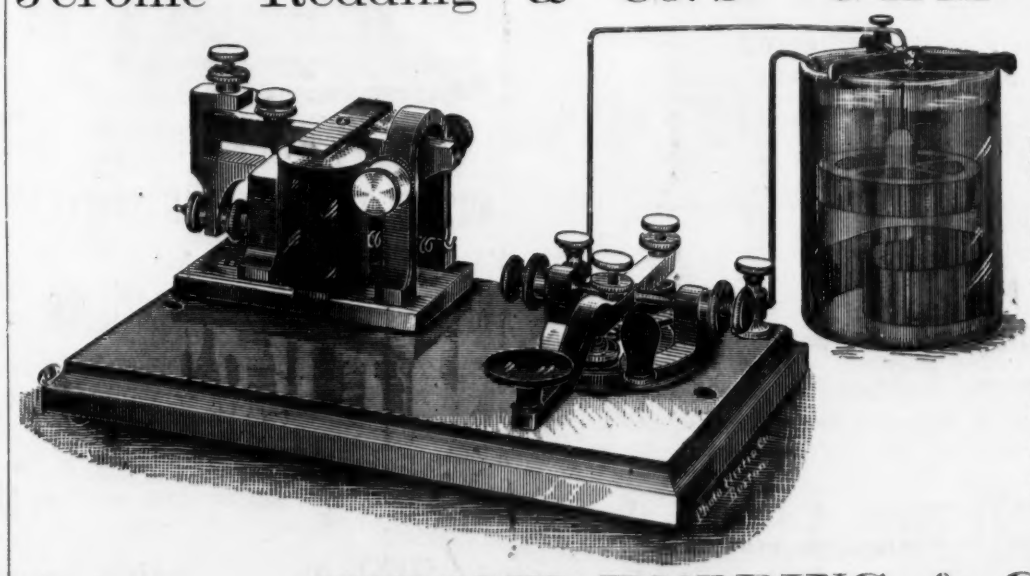

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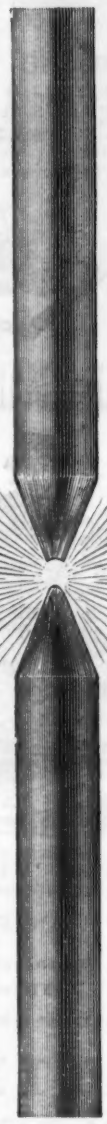

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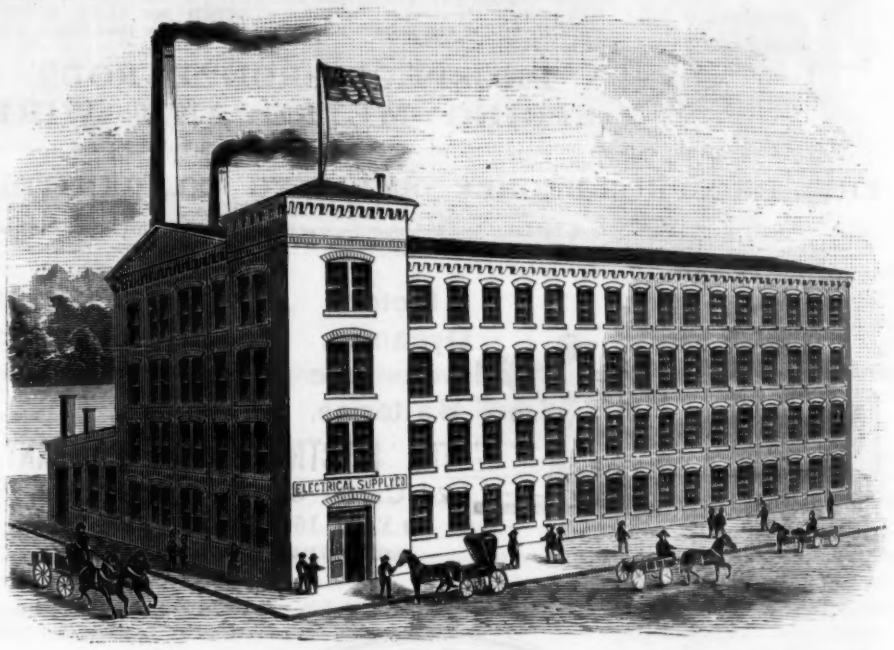

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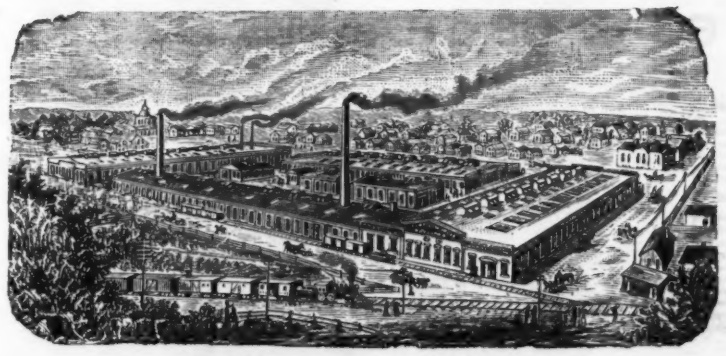

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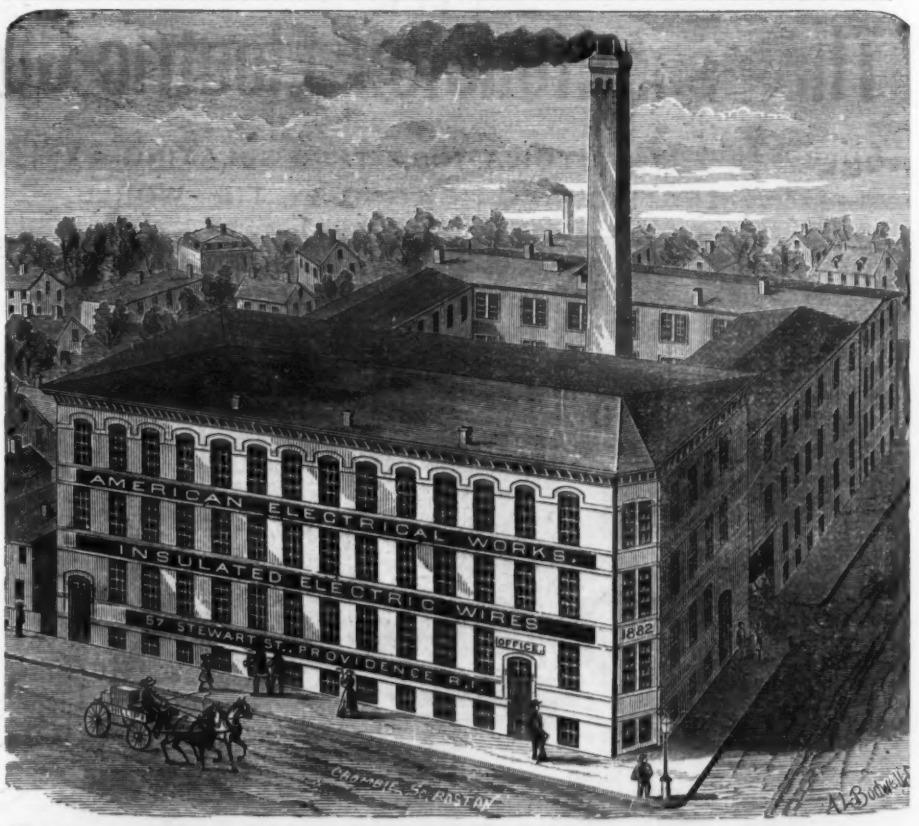

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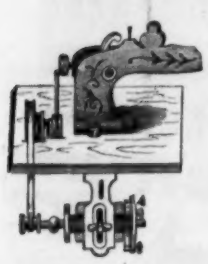

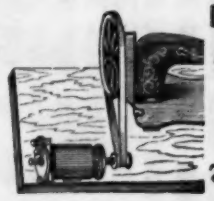

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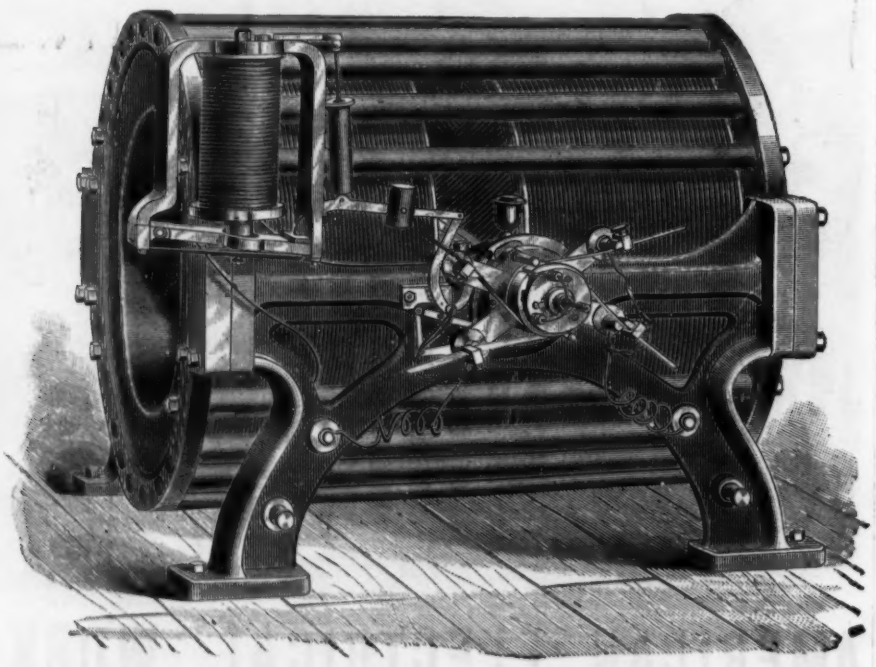

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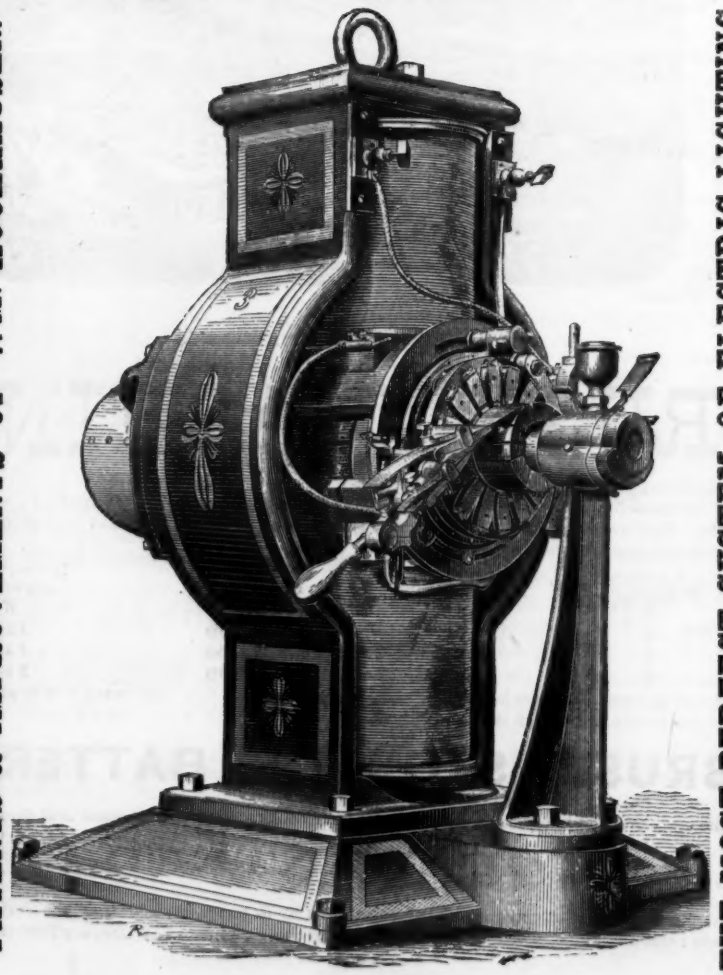

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